MICROSCAN

MS-Connect 5100 User Manual

P/N 84-005100 Rev A

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Disclaimer

The information and specifications described in this manual are subject to change without notice.

Latest Manual Version

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About the MS-Connect 5100

The key features of the MS-Connect 5100 are:

- Compact size
- Multidrop support for up to 32 readers
- Three built-in serial ports
- 10 Base-T / 100 Base-TX Ethernet port (TCP/IP and EtherNet/IP protocols)
- USB and RS-232 programming ports
- ESP® Software for configuration and testing
- CompactFlash® drive for troubleshooting and loading configuration profiles
- Easy DIN rail mounting

About This Manual

This manual provides complete information on setting up the MS-Connect 5100 and using it in an application setting. The sections are presented in the order that an MS-Connect 5100 is typically set up and made ready for operation.

Highlighting

Cross-references and web links are highlighted in **blue bold**. Menu topics and other points of emphasis are highlighted in **Bold Initial Caps**. References to the titles of extemal documents are italicized.

Statement of Agency Compliance

The MS-Connect 5100 has been tested for compliance with FCC (Federal Communications Commission) regulations and has been found to conform to all applicable FCC Rules and Regulations.

To comply with FCC RF exposure compliance requirements, this device must not be co-located or operate in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The MS-Connect 5100 has been tested for compliance with CE (Conformité Européenne) standards and guidelines, and has been found to conform to applicable CE standards, specifically the EMC requirements EN 55024, ESD EN 61000-4-2, Radiated RF Immunity EN 61000-4-3, ENV 50204, EFT EN 61000-4-4, Conducted RF Immunity EN 61000-4-6, EN 55022, Class B Radiated Emissions, and Class B Conducted Emissions.

The MS-Connect 5100 has been tested by an independent electromagnetic compatibility laboratory in accordance with the applicable specifications and instructions.

Statement of RoHS Compliance

All Microscan readers with a ‘G’ suffix in the FIS number are RoHS-Compliant. All compliant readers were converted prior to March 1, 2007. All standard accessories in the Microscan Product Pricing Catalog are RoHS-Compliant except 20-500013-01 and 98-000039-02. These products meet all the requirements of “Directive 2002/95/EC” European Parliament and the Council of the European Union for RoHS compliance. In accordance with the latest requirements, our RoHS-Compliant products and packaging do not contain intentionally added Deca-BDE, Perfluorooctanes (PFOS), or Perfluorooctanic Acid (PFOA) compounds above the maximum trace levels. To view the document stating these requirements, please visit:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0095:EN:HTML

and

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0032:0034:EN:PDF

Please contact your sales manager for a complete list of Microscan’s RoHS-Compliant products.

This declaration is based upon information obtained from sources which Microscan believes to be reliable, and from random sample testing; however, the information is provided without any representation of warranty, expressed or implied, regarding accuracy or correctness. Microscan does not specifically run any analysis on our raw materials or end product to measure for these substances.

The information provided in this certification notice is correct to the best of Microscan’s knowledge at the date of publication. This notice is not to be considered a warranty or quality specification. Users are responsible for determining the applicability of any RoHS legislation or regulations based on their individual use of the product.

Regarding “RoHS Directive 2011_65_EU” Microscan produces Monitoring and Control Instruments as well as Industrial Monitoring and Control Instruments as defined within the directive. Microscan has developed and is implementing a RoHS2 compliance plan with the intention of bringing all active products listed in our current marketing literature within full compliance as per the directive deadlines.

Key milestones for the transition plan are as follows:

- Complete internal product audit and supplier transition by July 2013.
- Initial “Monitoring and Control Instruments” RoHS2-compliant products available by July 2014.
- Initial “Industrial Monitoring and Control Instruments” RoHS2-compliant products available by July 2015.
- All new products introduced in 2014 are expected to be WEEE and RoHS2 compliant.

Microscan will mark the products with the ‘CE’ marking that complies with the RoHS2 process to acquire ‘CE’ certification per the example given: Example 1 >> Machinery directive + EMC directive + RoHS2 = Declaration of Conformity.

1 Setup and Operation

Contents

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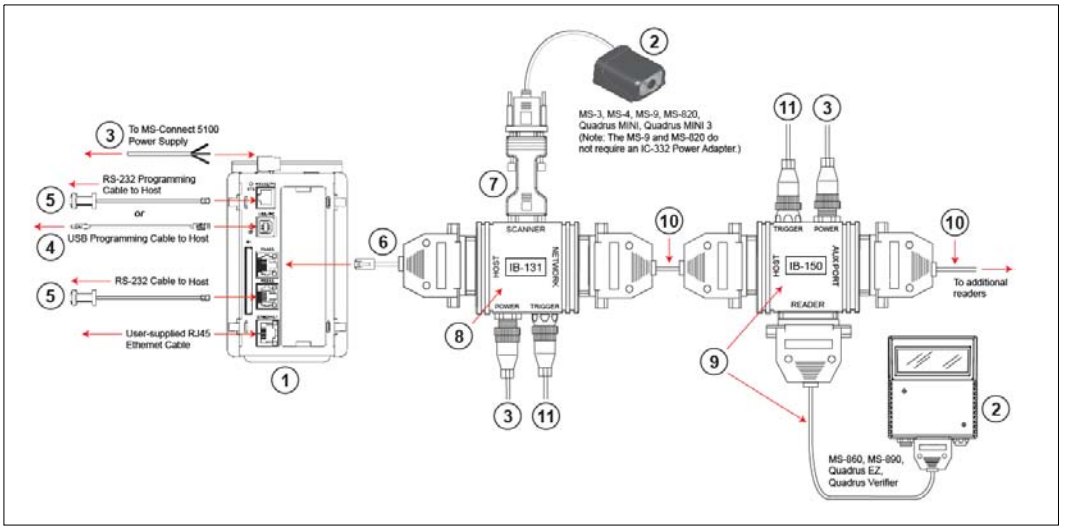
This section is designed to get your MS-Connect 5100 up and running quickly.

Following these steps will allow you to get a sense of the product's capabilities while you set it up for active operation.

Step 1 — Check Required Hardware

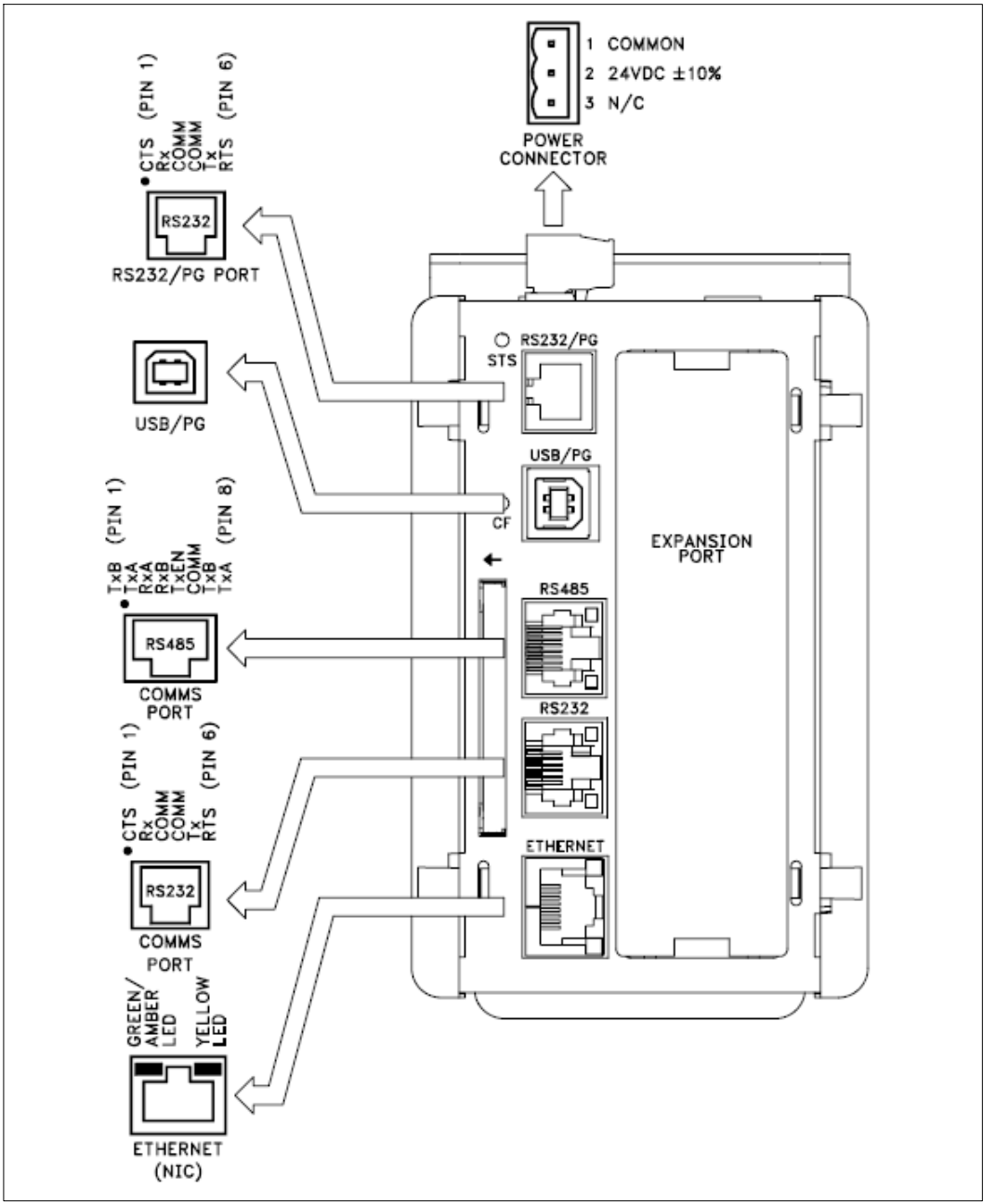
Item	Description	Part Number
1	MS-Connect 5100	FIS-5100-0001G
2	Microscan Reader (one per Multidrop address)	FIS-XXXX-XXXXG
3	MS-Connect 5100 Power Supply (24VDC) Reader Power Supply (24VDC; one required per reader)	97-100004-15
4	Programming Cable, USB, Type A to Type B, 6 ft.	61-000112-01
5	RS-232 Host Cable, 9-pin to RJ12, 6 ft.	61-000108-01
6	MS-Connect 5100 Concentrator Cable, 25-pin to RJ45, 10ft., gender changer	61-000113-01
7	IC-332 Adapter (5-volt readers only)	FIS-0001-0035G
8	IB-131 Interface Box	99-000018-01
9	IB-150 Kit, with reader cable, 6 ft.	98-000040-02
10	Multidrop Cable, 10 ft. (Gender changer required to connect IB-131 and IB-150)	61-100030-03
11	Object Detector (optional)	99-000017-01



Multidrop Network Hardware

Note: The Multidrop configuration shown above is just one example of configuration options. Any combination of Microscan readers and interface boxes can be used in the Multidrop network. See Step 7, **Set Up Software**, for more specific information about the cabling for each MS-Connect 5100 port.

Step 1 — Check Required Hardware (cont.)



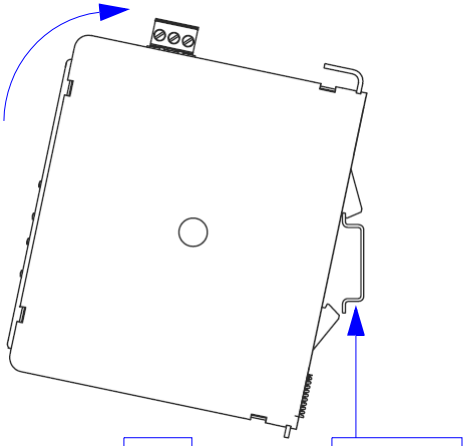
MS-Connect 5100 Port Pinouts

Step 2 — Install the MS-Connect 5100 Unit

Mount the MS-Connect 5100 to a DIN Rail

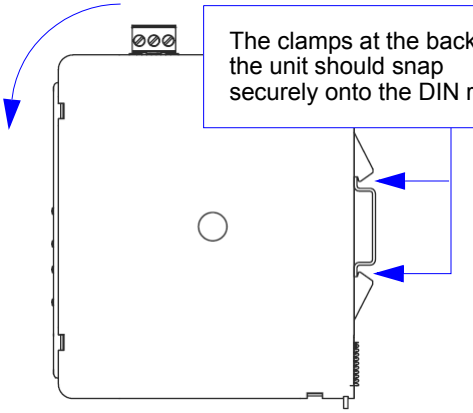
The DIN rail should be positioned horizontally so that the unit's ventilation holes are vertical in relation to cabinet orientation.

Attach the MS-Connect 5100 to the DIN rail as shown below.



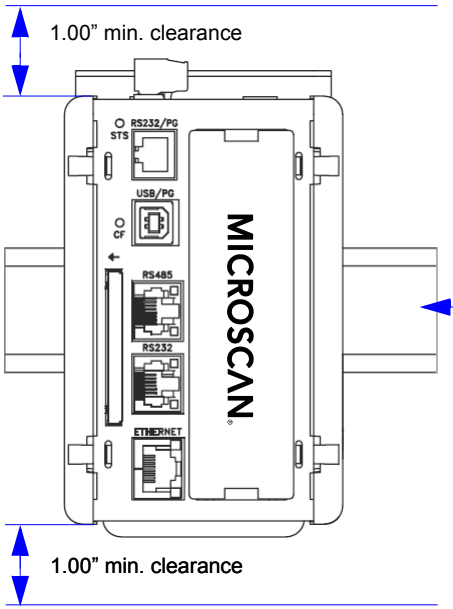
1

DIN rail



The clamps at the back of the unit should snap securely onto the DIN rail.

2



DIN rail

3

Note: A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Note: For an alternate mounting option, see **Mounting to Flat Surfaces** on page A-8.

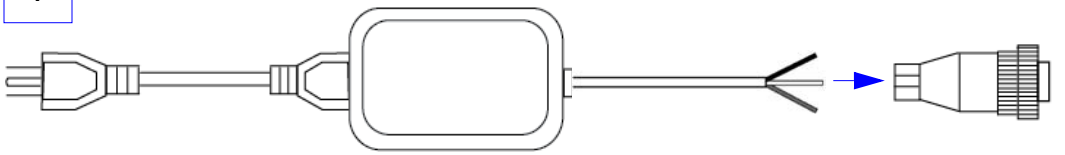
Step 3 — Connect Hardware for Multidrop

Power Connection Wiring

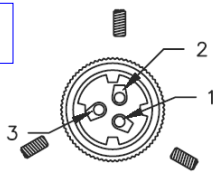
Once the MS-Connect 5100 unit has been physically installed in your application, the power supply can be wired to the unit.

> The Microscan power supply (97-100004-15) comes with a standard Micro-Change connector. You must remove the Micro-Change connector from the end of the cable and wire the cable directly to the screw terminal block at the top of the unit.

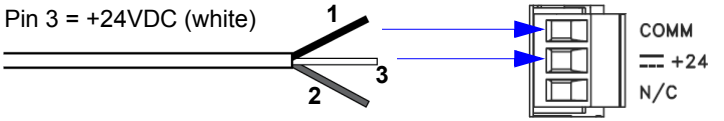
1 Remove the Micro-Change connector and wire-strip the power supply cable.



2



- Pin 1 = GND (black)
- Pin 2 = Shield
- Pin 3 = +24VDC (white)

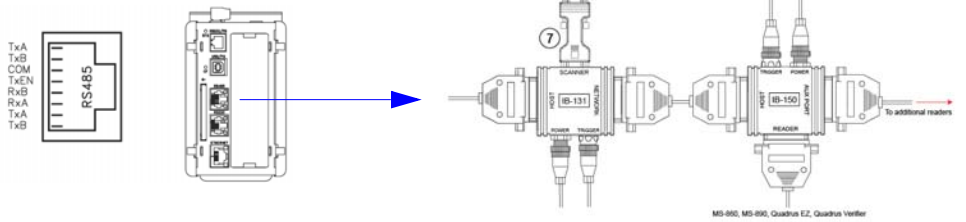


Multidrop Hardware Configuration

The MS-Connect 5100 can support up to 32 Microscan readers in Multidrop configuration.

Important: All readers must be configured for Multidrop before they can be added to the Multidrop network.

> Use the RS-485 port for the Multidrop network.



Note: The Multidrop configuration shown above is just one example of configuration options. Any combination of Microscan readers and interface boxes can be used in the Multidrop network. See Step 7, **Set Up Software**, for specific information about the uses of each MS-Connect 5100 port.

Step 4 — Apply Power to the Multidrop Network

Once you have configured your hardware for Multidrop and securely connected all other cabling, you can safely apply power to the MS-Connect 5100 and the connected readers.

> **CAUTION:** Be sure that all cables are connected **BEFORE** applying power to the system. Always power down **BEFORE** disconnecting any cables.

Important Notes

It is very important that the power supply is mounted correctly if the unit is to operate reliably. Please be sure to observe the following points:

- The power supply must be mounted close to the unit, with no more than 6 feet (1.8 m) of cable between the supply and the unit. Ideally, the shortest length possible should be used.
- The wire used to connect the unit's power supply should be at least 22-gauge wire. If a longer cable run is used, a heavier gauge wire should be used. The routing of the cable should be kept away from large contactors, inverters, and other devices which may generate significant electrical interference.
- A power supply with a Class 2 or SELV rating must be used. A Class 2 or SELV power supply provides isolation to accessible circuits from hazardous voltage levels generated by a mains power supply due to single faults. SELV is an acronym for "safety extra-low voltage". Safety extra-low voltage circuits shall exhibit voltages safe to touch both under normal operating conditions and after a single fault, such as a breakdown of a layer of basic insulation or after the failure of a single component has occurred.

Step 5 — Install ESP

Easy Setup Program (ESP) is Microscan's proprietary setup and testing application. The purpose of **ESP** is to provide a quick and easy way to set up and configure Microscan products.

When the MS-Connect 5100 is connected to a host computer (Windows Vista, XP, or 2000), **ESP** can be used to configure Multidrop settings and set up communication with a host.

If installing from the Microscan Tools Drive:

1. Insert the Microscan Tools Drive into a USB port on your computer.
2. Select **ESP Software** from the navigation bar at the left of the screen.
3. Click on **ESP Software** under the **Current Version** heading.
4. Click the **Run** button and follow the prompts in the **ESP** Setup Wizard.
   Note: During installation, you may see an Internet Explorer Security Warning that states: "The publisher could not be verified." If you see this warning, click **Run** to continue installation.

If downloading from the web:

1. Go to the Download Center at **www.microscan.com**.
2. Create a new member account or, if you are already a member, enter your user name and password.
3. Navigate to the "Microscan Software" section of the Download Center (near the top of the page).
4. Click on the link showing the latest version of **ESP**. Extract the **ESP** installation files to a location of your choice on the host computer. *Note where your **ESP.exe** file is stored on your hard drive.*
5. At the end of the installation process, the following icon will appear on your desktop:

6. Click the **ESP** icon to start the program.

System Requirements for ESP

- 166 MHz Pentium processor (recommended)
- Windows Vista, XP, or 2000 operating system
- Internet Explorer 5.0 or higher
- 64 MB minimum RAM
- 40 MB minimum disk space
- 800 x 600 pixel minimum 256 color display

Step 6 — Install USB Driver

When the MS-Connect 5100 is connected to a 24V power supply and the USB programming cable is connected to the host computer for the first time, you will be prompted to install the USB driver.

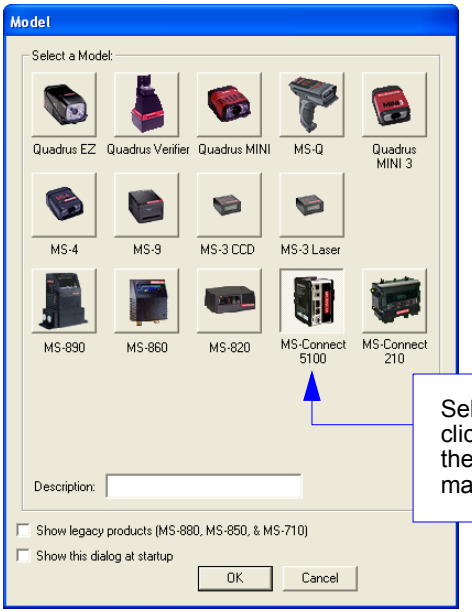
1. When you see the **Found New Hardware Wizard**, select **Install from Specific Location**.
2. Navigate to the ESP-5100\Device folder.

   Note: When **ESP** is installed, the MS-Connect 5100 USB driver is automatically placed on the host hard drive along with the other **ESP** installation files.

   Example Location: “C:\Program Files\Microscan\ESP-5100\Device”.
3. If the driver is selected, a non-compatibility warning will occur. this warning can be ignored.
4. After the driver is installed, an extra USB controller is displayed in the hardware **Device Manager**.

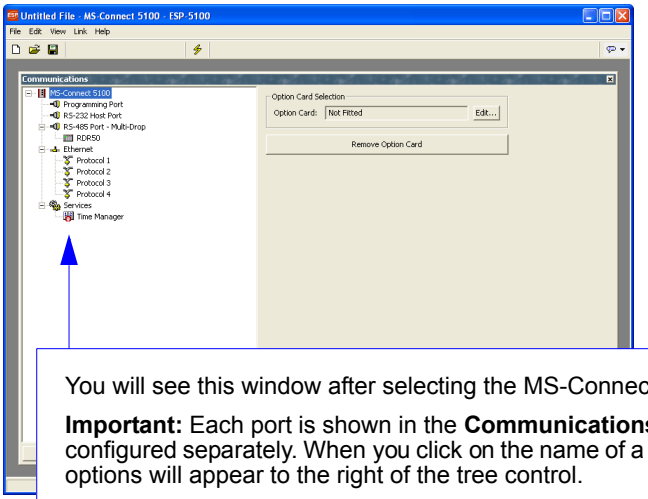
Step 7 — Set Up Software

1. After installing **ESP** and the USB driver, run the program and select the MS-Connect 5100 from the model menu.



Select the MS-Connect 5100 and click **OK**, or simply double-click the MS-Connect 5100 button to make your selection.

Note: It may take several seconds for the next screen to appear if this is the first time you have selected the MS-Connect 5100.

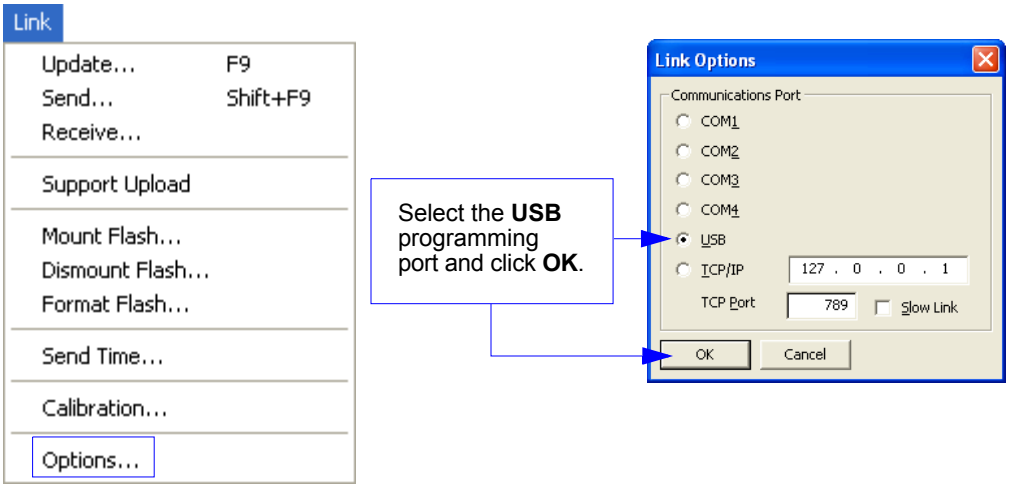


You will see this window after selecting the MS-Connect 5100.

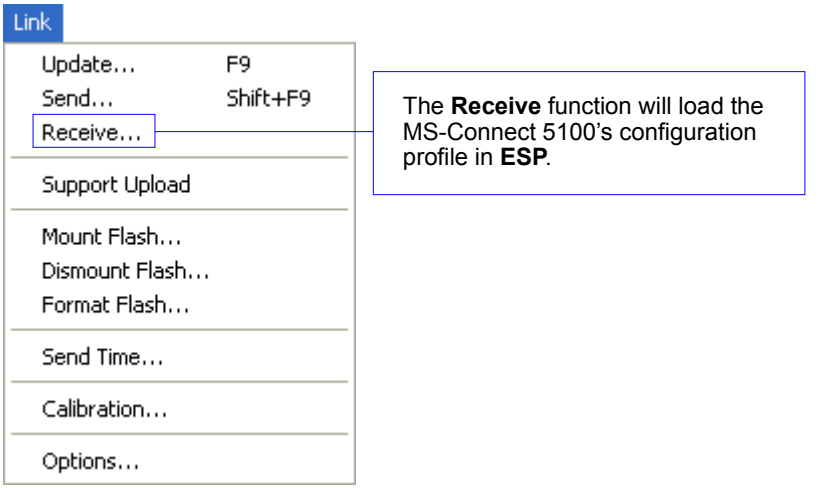
Important: Each port is shown in the **Communications** tree control, and must be configured separately. When you click on the name of a port, that port's configuration options will appear to the right of the tree control.

Set Up Software (cont.)

2. Once the **ESP** interface has appeared, select **Link > Options** to configure the programming port. Select **USB** from the list of options.

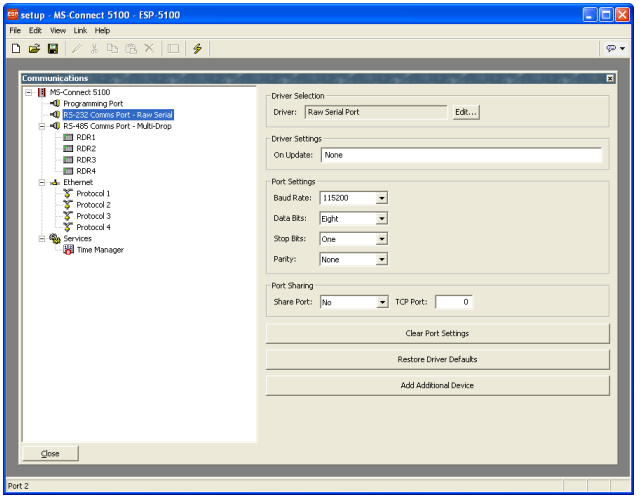


3. Select **Link > Receive** and save the configuration file.



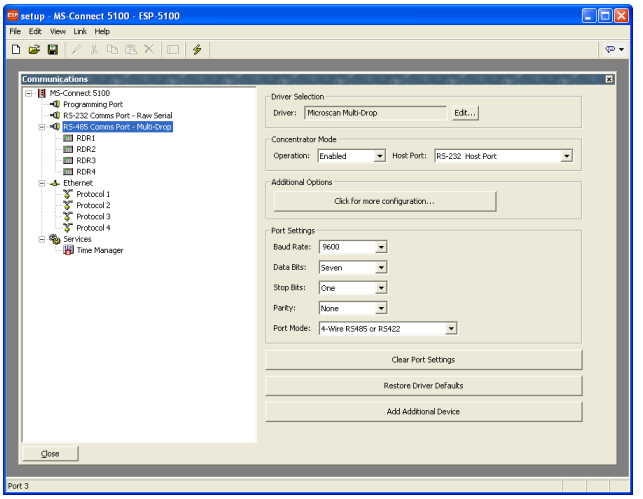
Set Up Software (cont.)

4. Set RS-232 **Port Settings** as required for communication between the host and the MS-Connect 5100. Verify that **Driver** is set to **Raw Serial Port**.



5. Set RS-485 **Port Settings** to the required connection settings for communication between the readers in the Multidrop network and the MS-Connect 5100.

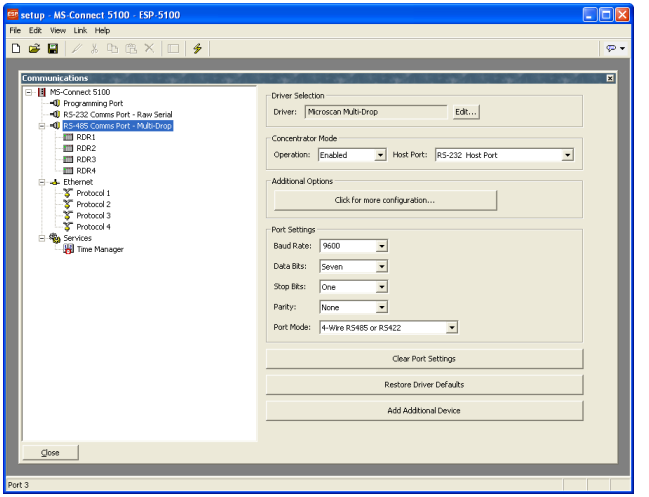
   Verify that **Driver** is set to **Microscan Multidrop**, **Concentrator Mode** is set to **Enabled**, **Host Port** is set to **RS-232 Host Port**, and **Port Mode** is set correctly for the current application.



Set Up Software (cont.)

6. The reader name and address can be configured in the **RS-485 Communications Port** tree.

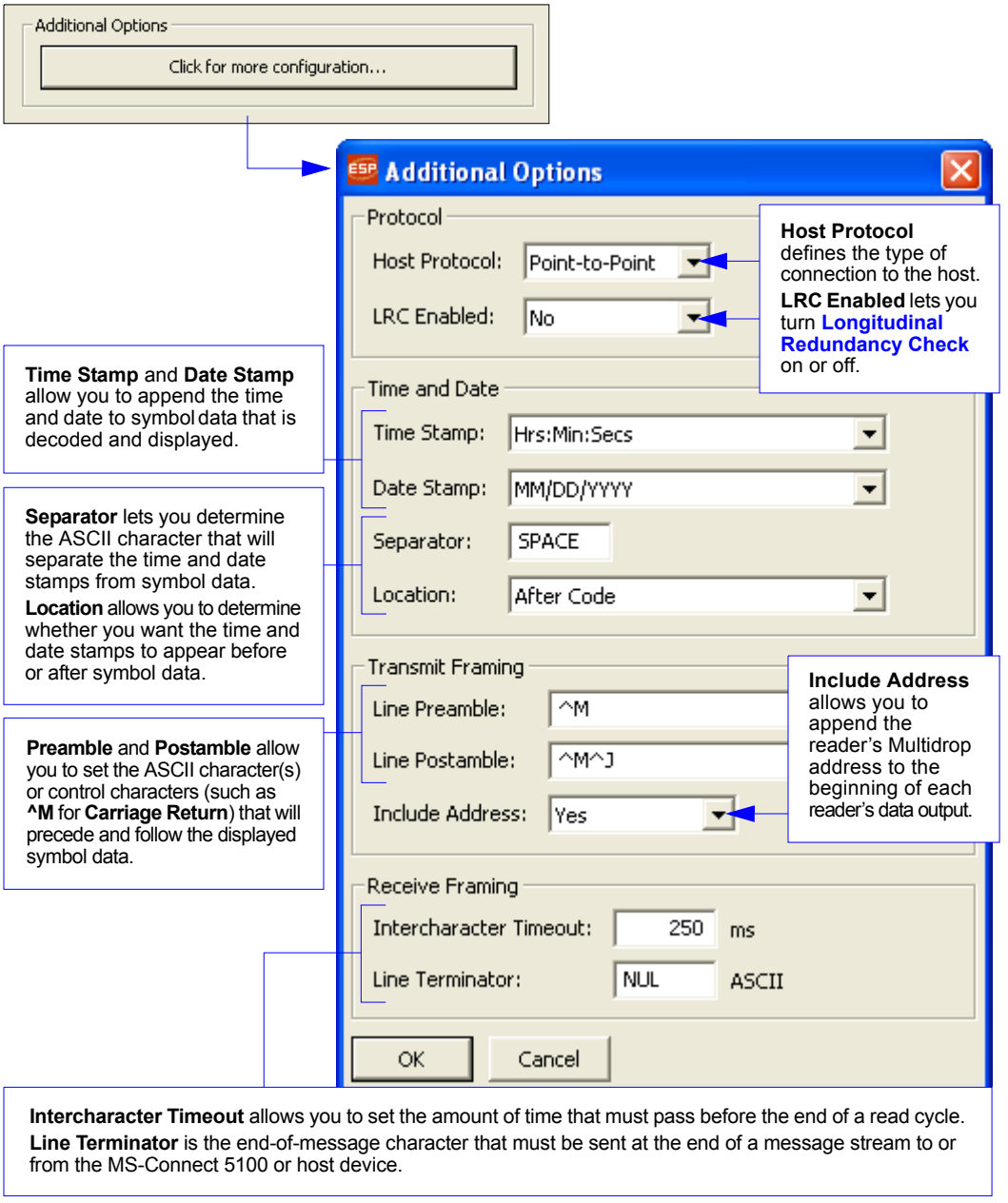
   The MS-Connect 5100 uses address **50**. Do not use this address for a reader. Select the **Enable Device** check box to enable the device.



The system is now ready for operation.

Additional Options

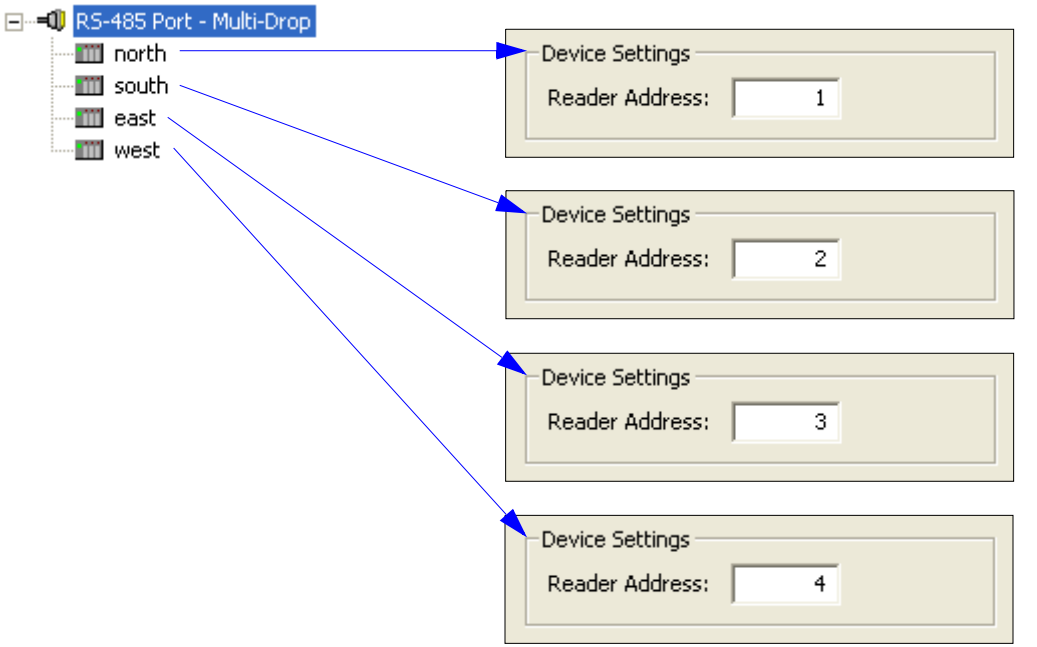
For additional RS-485 communications options, click the **Click for more configuration...** button in the **Additional Options** section of the RS-485 communications view. The **Additional Options** dialog will appear.


Additional Options
Click for more configuration...
Additional Options
Protocol
Host Protocol:
Point-to-Point
LRC Enabled:
No
Time and Date
Time Stamp:
Hrs:Min:Secs
Date Stamp:
MM/DD/YYYY
Separator:
SPACE
Location:
After Code
Transmit Framing
Line Preamble:
^M
Line Postamble:
^M^J
Include Address:
Yes
Receive Framing
Intercharacter Timeout:
250
ms
Line Terminator:
NUL
ASCII
OK
Cancel
Host Protocol defines the type of connection to the host.
LRC Enabled lets you turn Longitudinal Redundancy Check on or off.
Time Stamp and Date Stamp allow you to append the time and date to symbol data that is decoded and displayed.
Separator lets you determine the ASCII character that will separate the time and date stamps from symbol data.
Location allows you to determine whether you want the time and date stamps to appear before or after symbol data.
Preamble and Postamble allow you to set the ASCII character(s) or control characters (such as ^M for Carriage Return) that will precede and follow the displayed symbol data.
Include Address allows you to append the reader's Multidrop address to the beginning of each reader's data output.
Intercharacter Timeout allows you to set the amount of time that must pass before the end of a read cycle.
Line Terminator is the end-of-message character that must be sent at the end of a message stream to or from the MS-Connect 5100 or host device.

Add Devices

The MS-Connect 5100 supports up to 32 Microscan readers in a Multidrop network. After all devices (readers) in the network have been added, you must assign a station number (Multidrop address) to each.

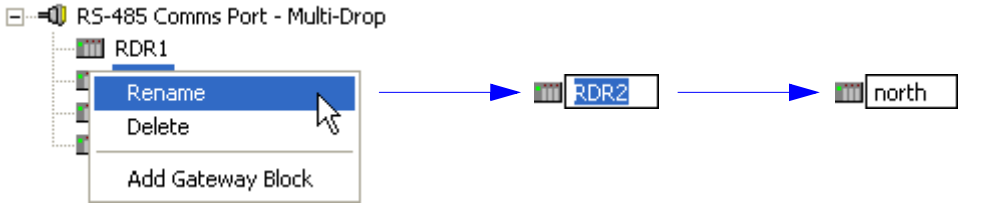
> Each reader must be assigned its own Multidrop address when it is added to the network.



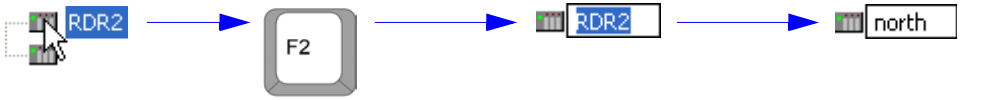
Renaming a Device

You can rename each device shown in the tree control to reflect specific characteristics of your application, as in the example shown below. There are two ways to rename a device:

- Right-click the device icon and select **Rename**, then type the new name.



- Or, select the device and press the **F2** key, then type the new name.

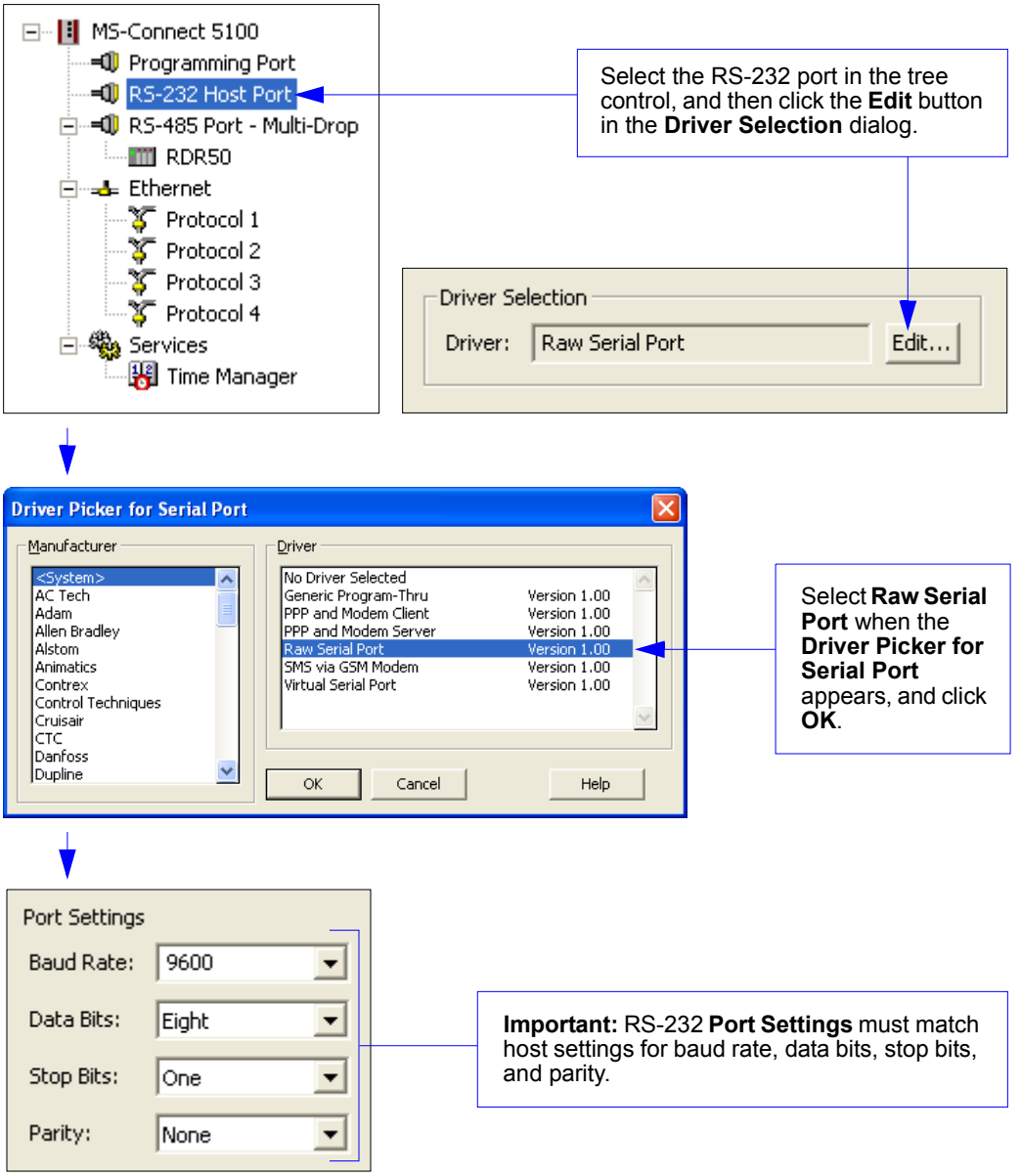


Host Port Settings

RS-232

You must adjust the RS-232 host port to send polled data in the proper format.

To adjust the RS-232 host port:



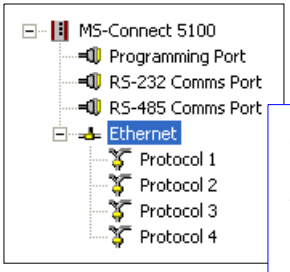
Ethernet TCP/IP

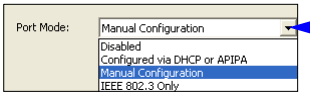
Note: For an explanation of **EtherNet/IP**, see **EtherNet/IP Overview** in Chapter 2, **Using ESP**.

You must adjust the Ethernet host port to send polled data in the proper format.

To adjust the Ethernet TCP/IP host port:

1



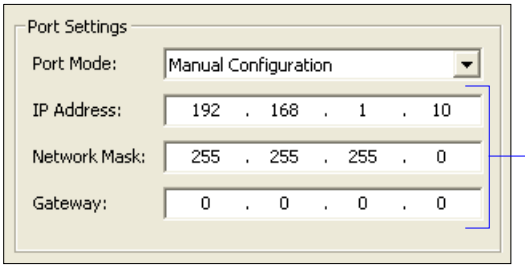


Select **Ethernet** in the tree control and then select Port Mode.

Manual Configuration: Port settings are manually configured as shown below.

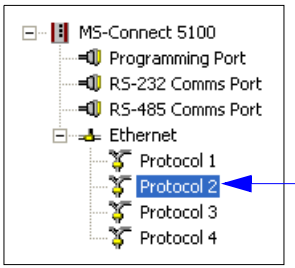
DHCP or APIPA: Port settings are configured automatically. Identify the MS-Connect 5100 by the MAC address.

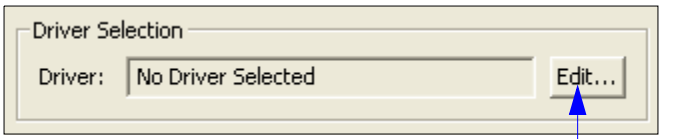
2



Enter the IP Address, Network Mask, and Gateway Address.

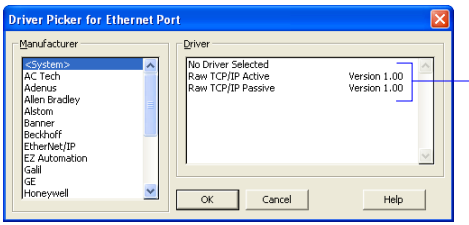
3





Then select one of the **Protocol** options and click the **Edit** button when the **Driver Selection** dialog appears.

4



Select **Raw TCP/IP Active** or **Raw TCP/IP Passive** to determine how the connection is established.

Note: In **Active**, the MS-Connect 5100 establishes a connection with the host, and in **Passive**, the host establishes the connection.

If you are using **Active TCP/IP**, enter the **IP Address** and **TCP/IP Port** of the host before saving changes to the MS-Connect 5100.

If you are using **Passive TCP/IP**, enter the TCP port number where the host will establish its connection.

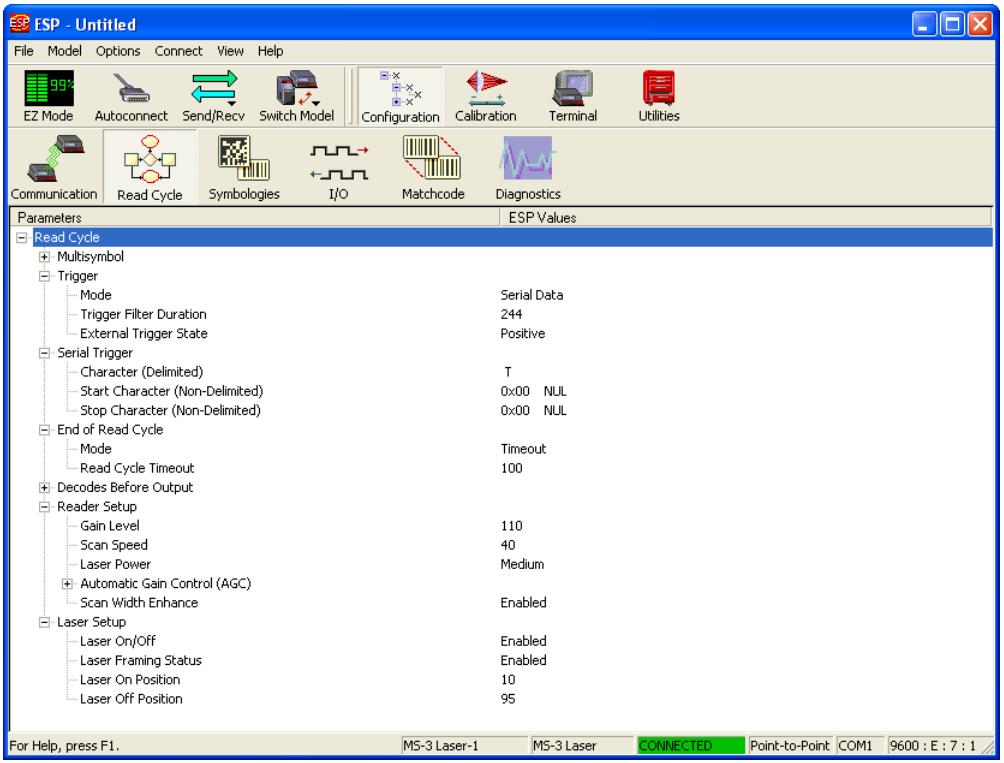
Step 8 — Configure the Reader

Every application is unique, and each Microscan reader has different configuration requirements. Refer to the User Manual for the Microscan reader or readers being used in your application.

Important: All readers must be configured for Multidrop *before* they can be added to a Multidrop network.

Reader Setup

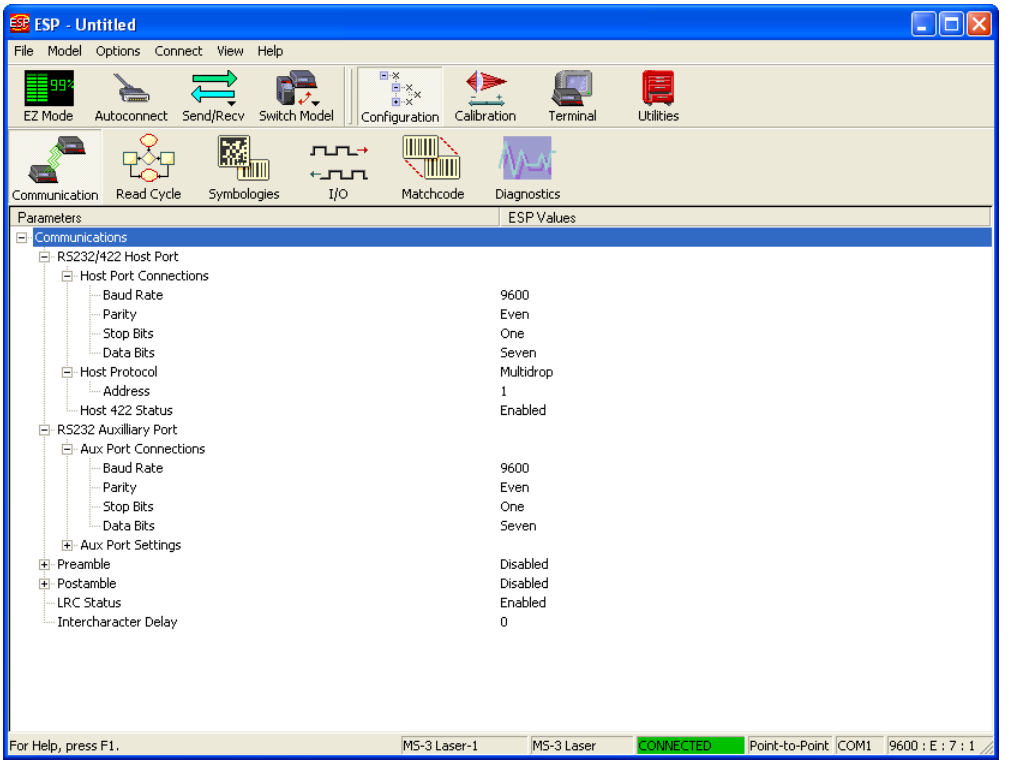
1. Start **ESP** and connect to the reader. (An MS-3 Laser Scanner is used in the example below.)
2. In the **Read Cycle** tree control, set **Trigger Mode** to **Serial Data** to test.



3. Set the **Serial Trigger Character** to **T**.
4. In **Laser Setup**, set **Laser On/Off** to **Enabled** to see the beam switch on when the unit is triggered. (Applicable to laser scanners only.)

Reader Setup (cont.)

5. In the **Communications** tree control, disable **Preamble** and **Postamble**.



6. Set **RS-232/422 Host Port** parameters to match the MS-Connect 5100 Multidrop port.
7. Set **Host Protocol** to **Multidrop**.
8. Set the **Host Protocol Address** of the first reader to **1**.

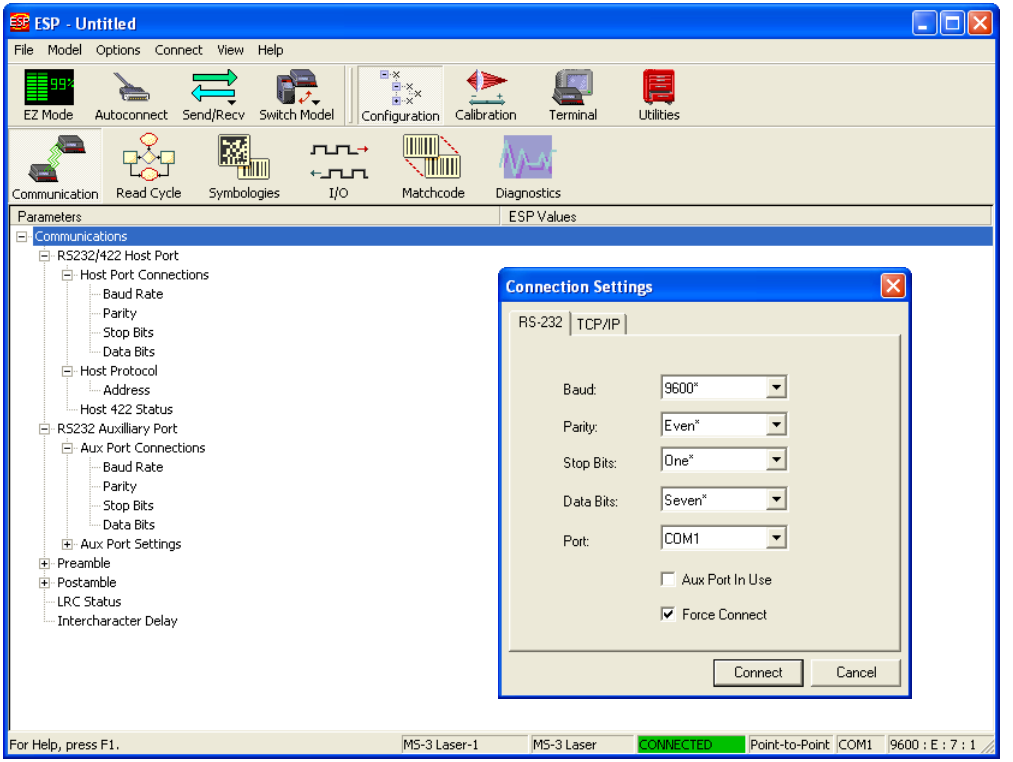
   Important: Be sure that each reader in the network has its own unique address.
9. Set **Host 422 Status** to **Enabled**.
10. Set **LRC Status** to **Enabled**.
11. **Send and Save** settings. Communications with the reader will be lost.

    Note: ESP may show the communication status as **CONNECTED** during this interval, but it is not.

    Important: To test the system, you will need to **Force Connect** using **ESP**, or use another terminal program. Use the same connection speed currently set on the MS-Connect 5100's RS-232 Com Port. The MS-Connect 5100's **RS-232 Port** (not the RS-232/PG Port) must be connected to the host system.

Step 9 — Test the System

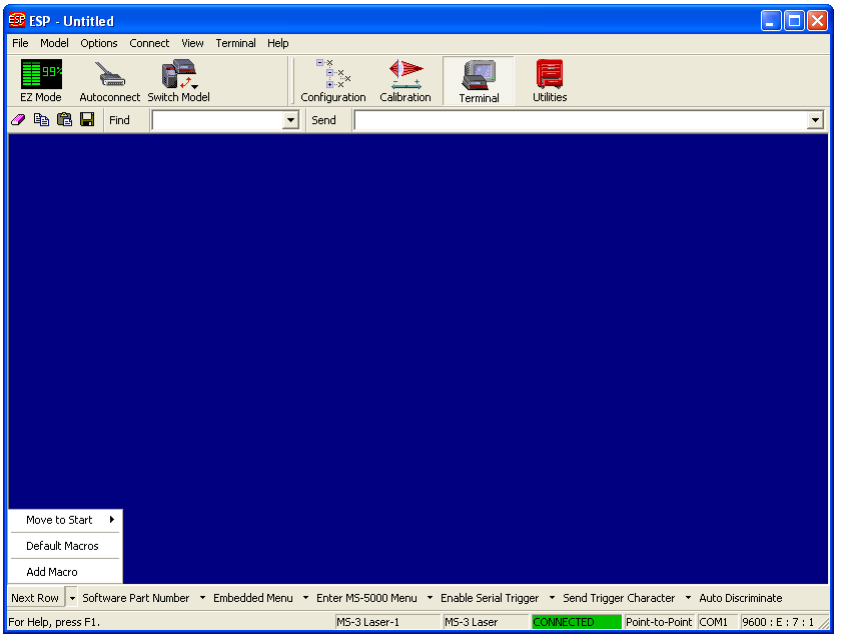
1. **Force Connect** using **ESP**, or use another terminal program. Use the same connection speed currently set on the MS-Connect 5100's RS-232 Com Port.



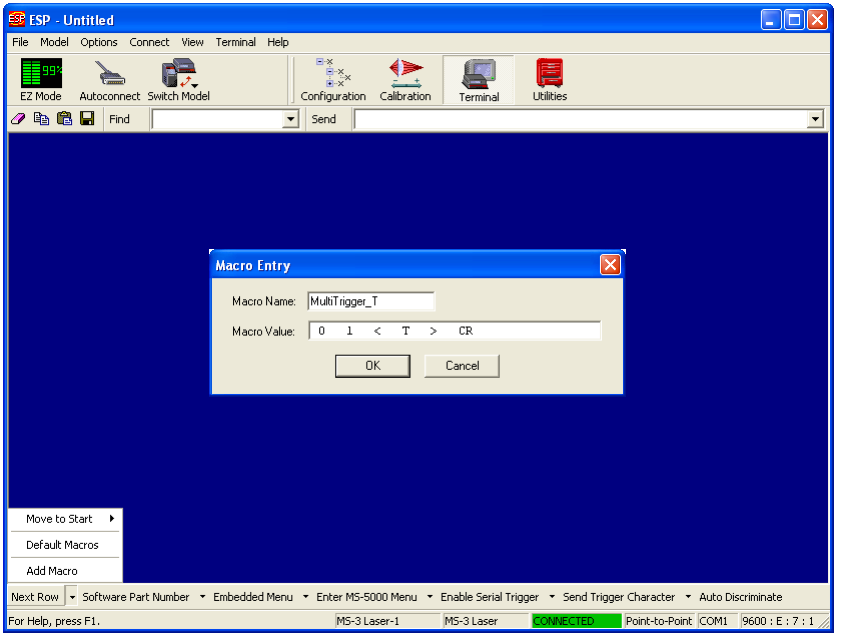
2. Connect the MS-Connect 5100 **RS-232 Port** (not the RS-232/PG Port) to the host system.

Test the System (cont.)

3. Create a new macro with entry **01<T>CR**. **CR** can be entered by typing **<Ctrl>+m**.

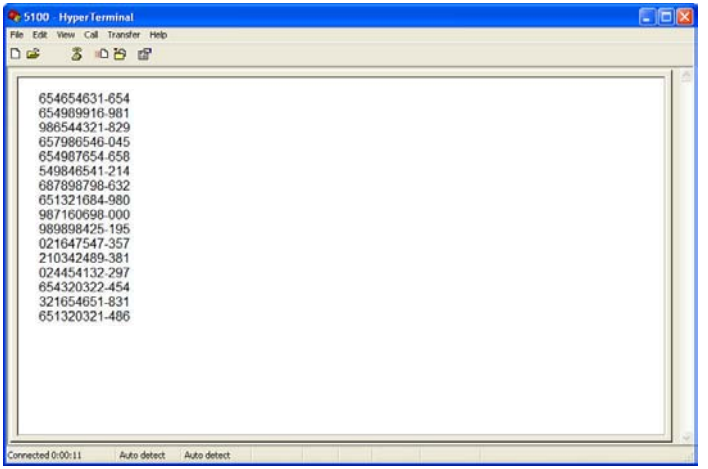


4. Trigger the reader by clicking the appropriate macro button.



Step 10 — Begin Active Operation of Network

Once all ports and devices are configured, you can begin capturing data.



For information about the Microscan products that can be used with the MS-Connect 5100, consult the documentation on your Microscan Tools Drive or visit **www.microscan.com**.

2 Using ESP

Contents

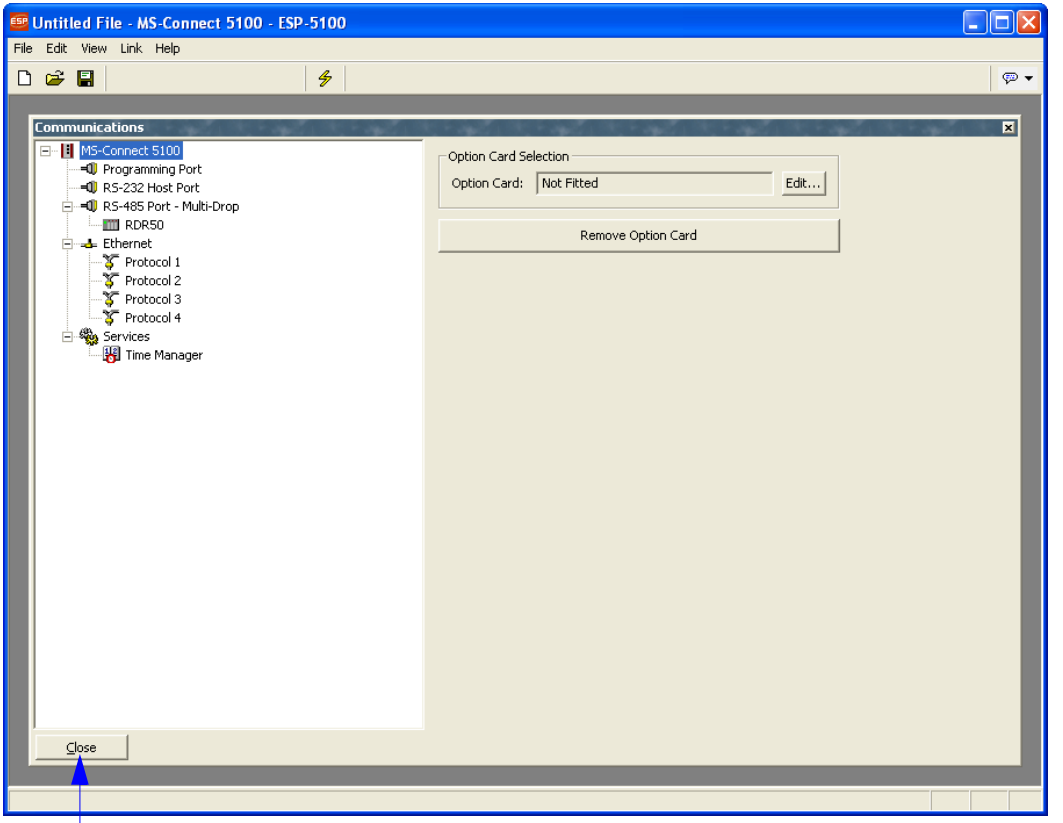
Communications Window 2-5
Menu Toolbar 2-6
Configuring Communications 2-12
Time Manager 2-25

The MS-Connect 5100 is configured using **ESP** Software. **ESP** is available from Microscan's website, and on the Microscan Tools Drive.

When you configure the MS-Connect 5100 using the latest version of **ESP**, you are assured that your unit has the most up-to-date feature set available. **ESP** software can configure the MS-Connect 5100 through the USB/PG port and the RS-232/PG port.

Communications Window

When the main MS-Connect 5100 **ESP** view appears, it will look like this:

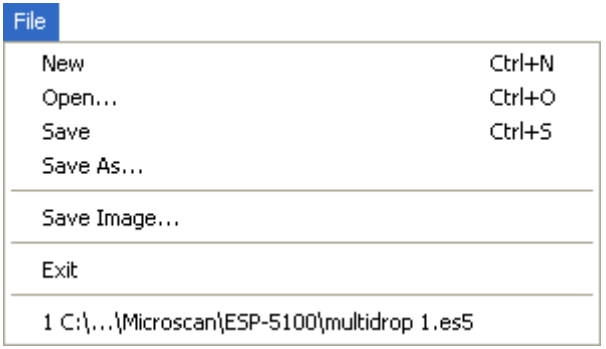


Note: If you close the **Communications** view, the main window will close and the **Communications** icon will appear at the center of the screen. You can return to the main window by double-clicking the icon.

Menu Toolbar

ESP's **Menu Toolbar** offers several configuration options in a series of dropdown menus.

File



New

Whenever **New** is selected, the default configuration of **ESP** is loaded.

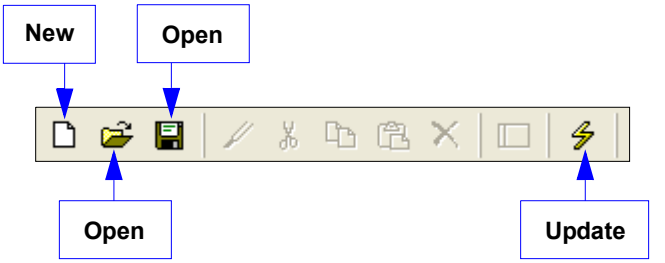
Open / Save

When **Save** or **Save As** is selected, the **ESP** configuration is saved to the host computer's hard drive and available whenever the same file is selected under **Open**.

View

Toolbar

When **Toolbar** is selected, the graphic toolbar is displayed toward the top of the screen.



Status Bar

When **Status Bar** is selected, the area at the bottom of the screen defines and explains the function or operation currently in view.

Refresh

The **Refresh** command refreshes the display, reapplying sorts and filters.

Link

Update

When you make new configuration changes, you can use the **Update** command to activate those changes in the MS-Connect 5100.

Update sends *only the most recently changed configuration parameters* to the MS-Connect 5100.

The **F9** key can also be used to send the **Update** command, as well as the **Update** icon in the toolbar:

Send

The **Send** command transfers all current configuration settings to the MS-Connect 5100.

Shift+F9 can also be used to initiate the **Send** command.

Receive

Receive will load the MS-Connect 5100's configuration profile in **ESP**.

Mount Flash

Remote firmware updates over TCP/IP require the MS-Connect 5100 to be fitted with a CompactFlash card.

Mount Flash enables Windows Explorer to access the MS-Connect 5100's CompactFlash card.

Dismount Flash

Remote firmware updates over TCP/IP require the MS-Connect 5100 to be fitted with a CompactFlash card.

Dismount Flash prevents Windows Explorer from accessing the MS-Connect 5100's CompactFlash card.

Format Flash

Remote firmware updates over TCP/IP require the MS-Connect 5100 to be fitted with a CompactFlash card.

Format Flash creates a new file system on the MS-Connect 5100's CompactFlash card.

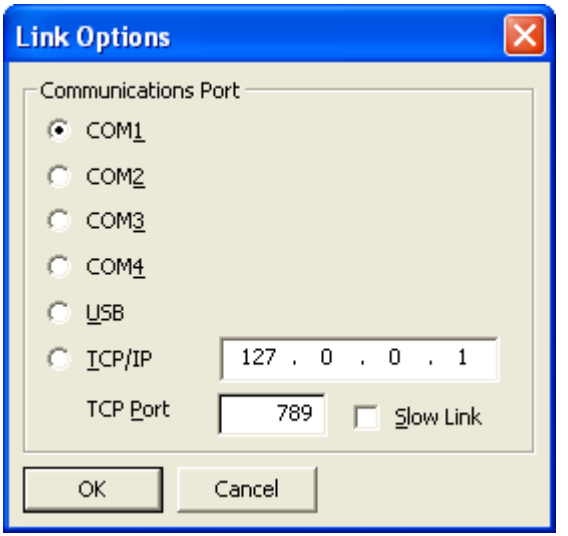
Send Time

Send Time sends the host computer's real-time clock setting to the MS-Connect 5100.

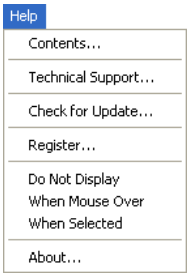
Important: Use the **Send Time** function to match the time and date in the MS-Connect 5100 with the time and date of the host computer sending commands.

Options

Options brings up a dialog that allows you to select serial, USB, or TCP/IP communication with the MS-Connect 5100.



Help



Contents

Displays **ESP**'s Help system menu for the MS-Connect 5100.

Technical Support

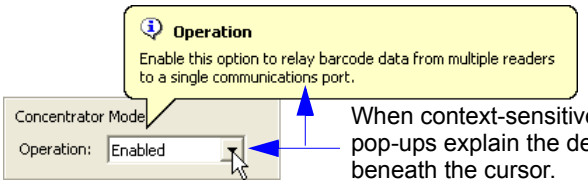
Displays Microscan's technical support contact information.

Do Not Display

Disables **ESP**'s context-sensitive Help pop-ups ("Mouse Over").

When Mouse Over

Enables **ESP**'s context-sensitive Help pop-ups, but only when the cursor is placed over objects of interest.


Operation
Enable this option to relay barcode data from multiple readers to a single communications port.
Concentrator Mode
Operation:
Enabled

When context-sensitive Help is enabled for "Mouse Over", pop-ups explain the definition and use of objects directly beneath the cursor.

When Selected

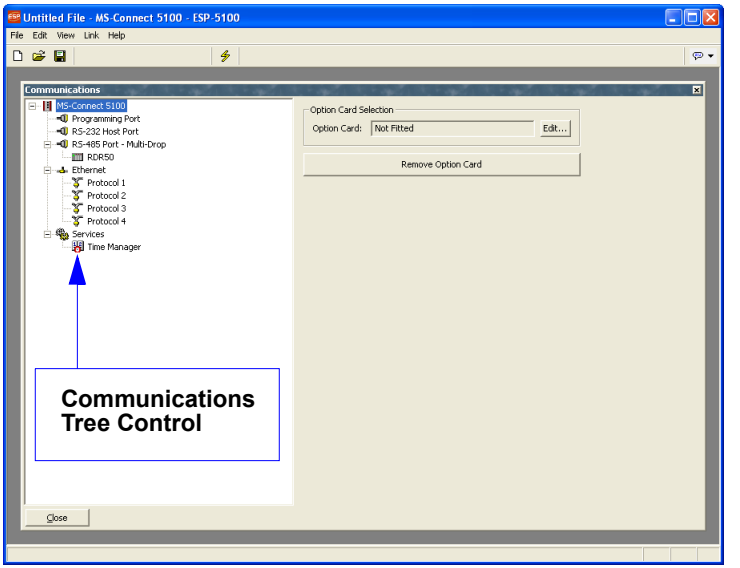
Enables **ESP**'s context-sensitive Help pop-ups, but only when objects of interest are specifically selected.

About...

Displays information about the current version of **ESP** for the MS-Connect 5100.

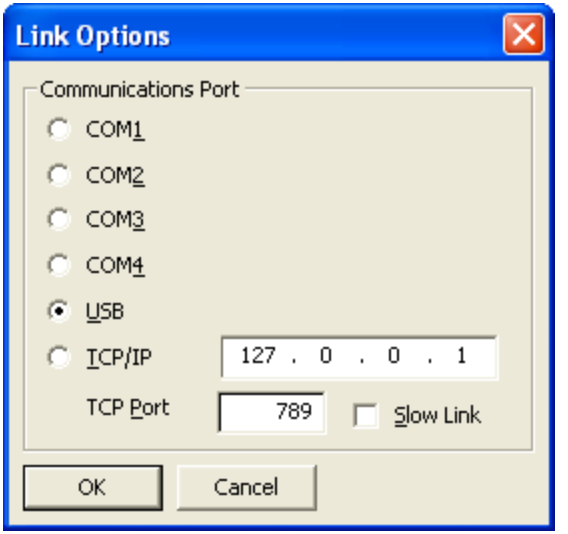
Configuring Communications

The **Communications** window lists the MS-Connect 5100's available ports in the form of a tree control.



Selecting a Programming Port

The programming link between the host computer and the MS-Connect 5100 is made using an RS-232 serial port or a USB port. Before downloading configuration profiles, use the **Link Options** dialog to select your programming link.



Verifying the USB Programming Link

If you are using the USB programming link, be sure that the USB driver has been installed correctly.

See **Install USB Driver** for installation instructions.

Downloading Configuration Settings

A configuration profile can be downloaded in its entirety, or recent changes to settings can be downloaded individually.

Select **Send** to download all configuration settings simultaneously.

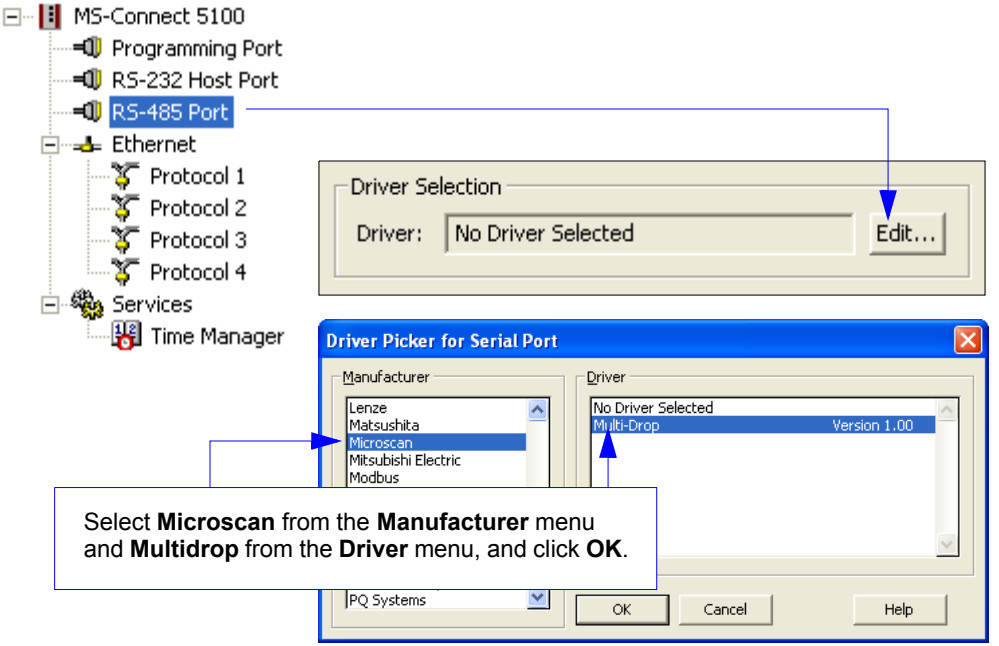
Select **Update** to download only the most recently changed configuration settings.

Selecting a Serial COM Port

If you are using the serial programming port (RS-232/PG) as a COM port, it will not be available for downloading commands. If the serial programming port must be used for communications, it is highly recommended that you use the USB port for your programming link. Microscan recommends using the RS-232/PG port for programming only.

Selecting Microscan Multidrop

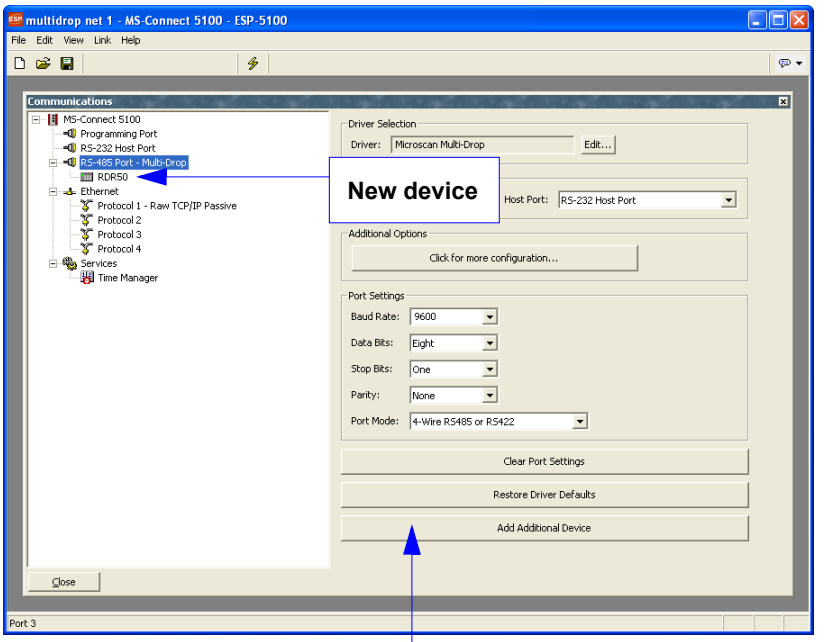
To select a protocol for a specific COM port, click on that port's icon in the **Communication** window's tree control, and then click **Edit** to the right of the **Driver** text field in the right-hand pane. The **Driver Picker for Serial Port** dialog will appear.



Working with Devices

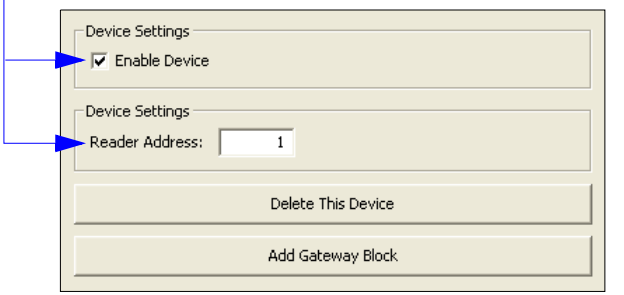
After you have selected **Microscan Multidrop**, you will see the RS-485 settings shown below

Notice that a device has been added below the **RS-485 Multidrop** entry in the tree control. The MS-Connect 5100 can poll up to **32** devices concurrently. **ESP** allows you to create more than 32 devices, but no more than 32 should be simultaneously active. Each reader must be assigned a unique address ranging from **1** to **50**.



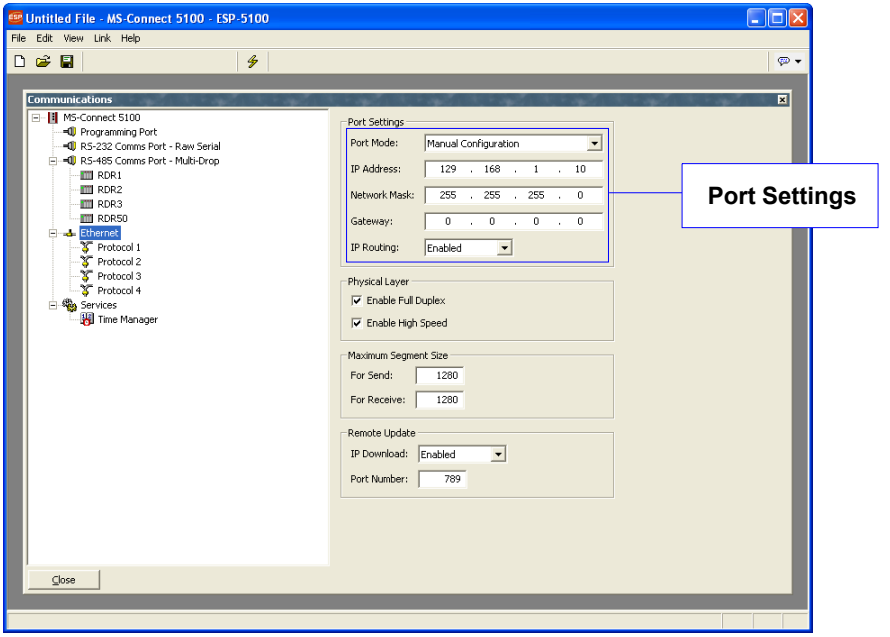
You can add devices to the Multidrop network by clicking the **Add Additional Device** button.

Click the desired reader icon to assign and manage reader addresses in the right pane of the **Communications** window.



Ethernet Port Configuration

You can navigate to the Ethernet view by clicking on the Ethernet icon in the left-hand pane of **ESP**'s **Communications** window. When this icon is selected, the following view is displayed:



Port Settings

The **Port Mode** options determine whether or not the port is enabled, and the method by which the port is to obtain its IP configuration.

If **Manual Configuration** (the recommended mode) is selected, the **IP Address**, **Network Mask**, and **Gateway** fields must be filled out with the appropriate information.

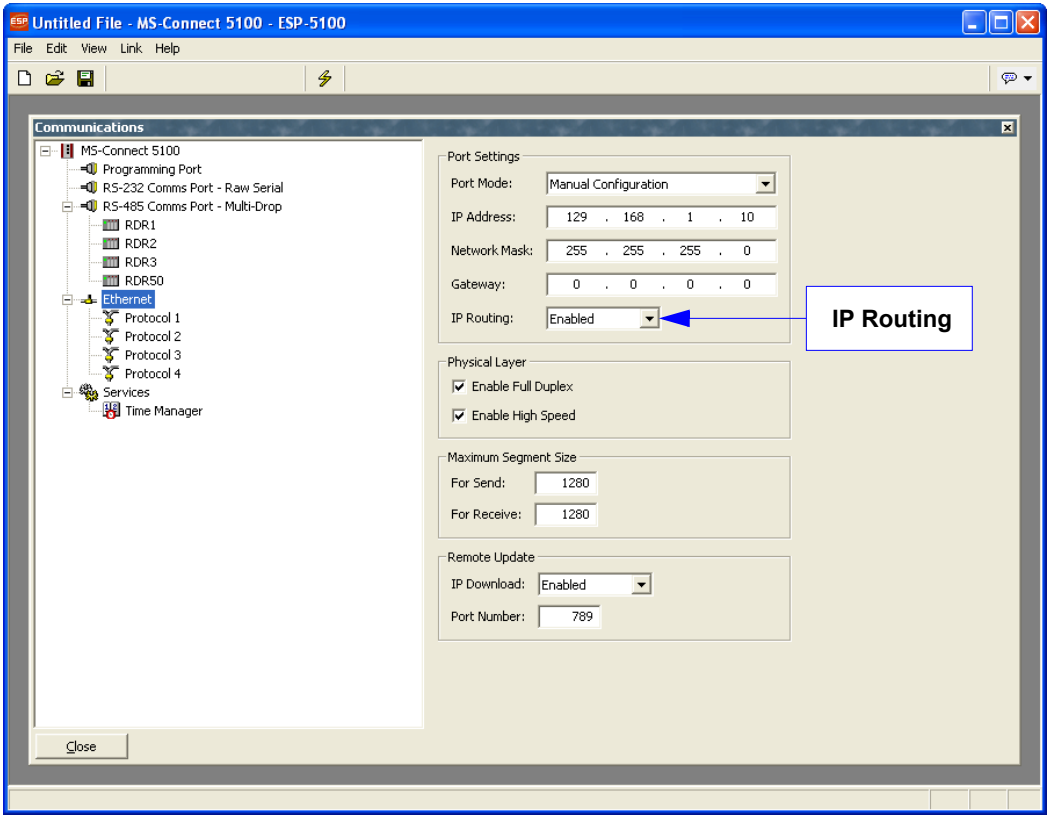
If **DHCP** or **APIPA** is selected, the IP address is automatically received from the host. The MS-Connect 5100 is identified by the MAC address.

Important: Be sure to consult your network administrator when selecting appropriate values for these fields, and be sure to enter and download these values before connecting the MS-Connect 5100 to your network. If you fail to do this, it is possible—although unlikely—that you will cause network problems.

Note: The default values provided for these fields will almost never be suitable for your application; consult your IT department for appropriate settings.

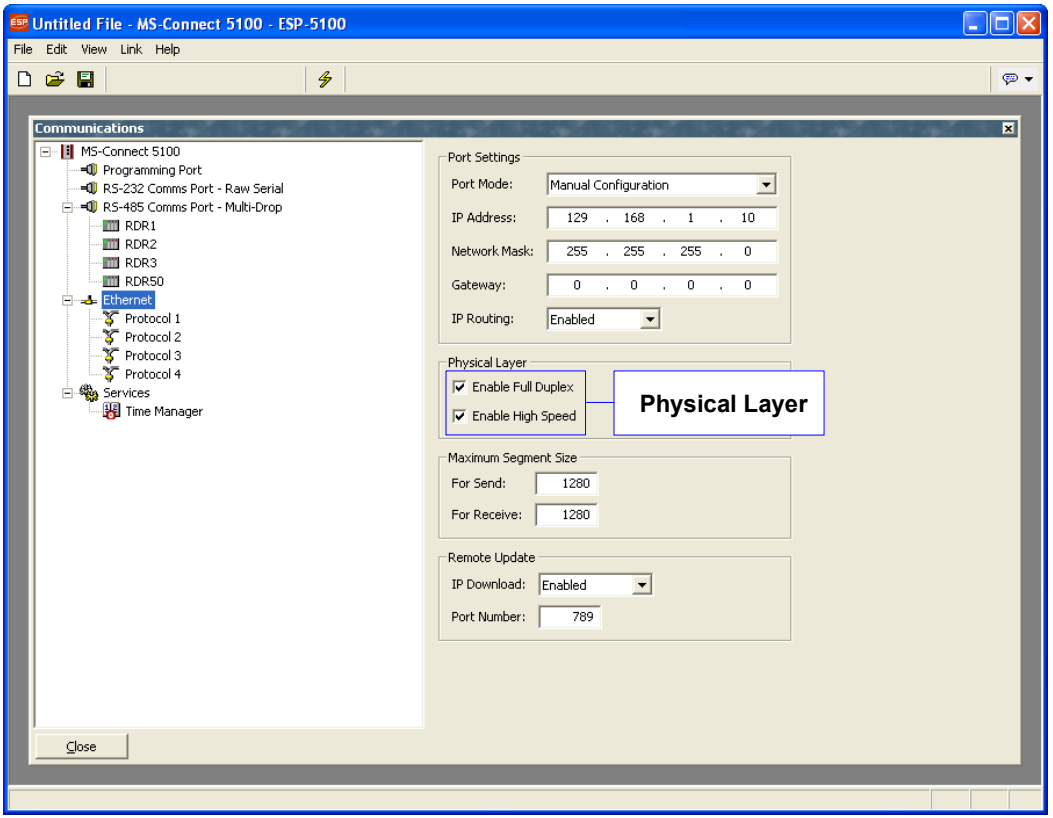
IP Routing

The **IP Routing** option can be used to enable or disable the routing of IP packets between the Ethernet port and any connections made to or by the MS-Connect 5100. Do not enable this option unless you understand the implications of allowing such routing.



Physical Layer

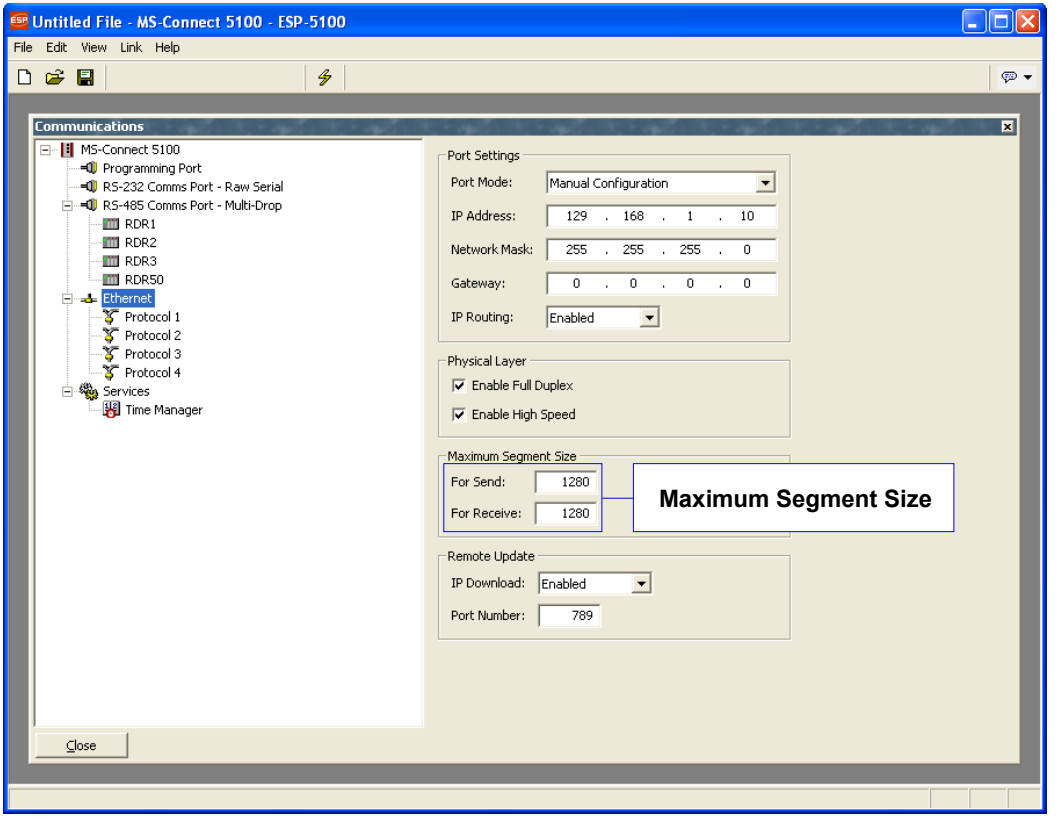
The **Physical Layer** options control the type of connection that the MS-Connect 5100 will attempt to negotiate with the hub to which it is connected. Generally, these options can be left in their default states, but if you have trouble establishing a reliable connection, especially when connecting directly to a PC without an intervening hub or switch, consider turning off both **Full Duplex** and **High Speed** operation to see if this solves the problem.



Maximum Segment Size

Maximum Segment Size is the maximum length of the data packet that is sent or received. This value can be user-defined in the **For Send** and **For Receive** fields shown below.

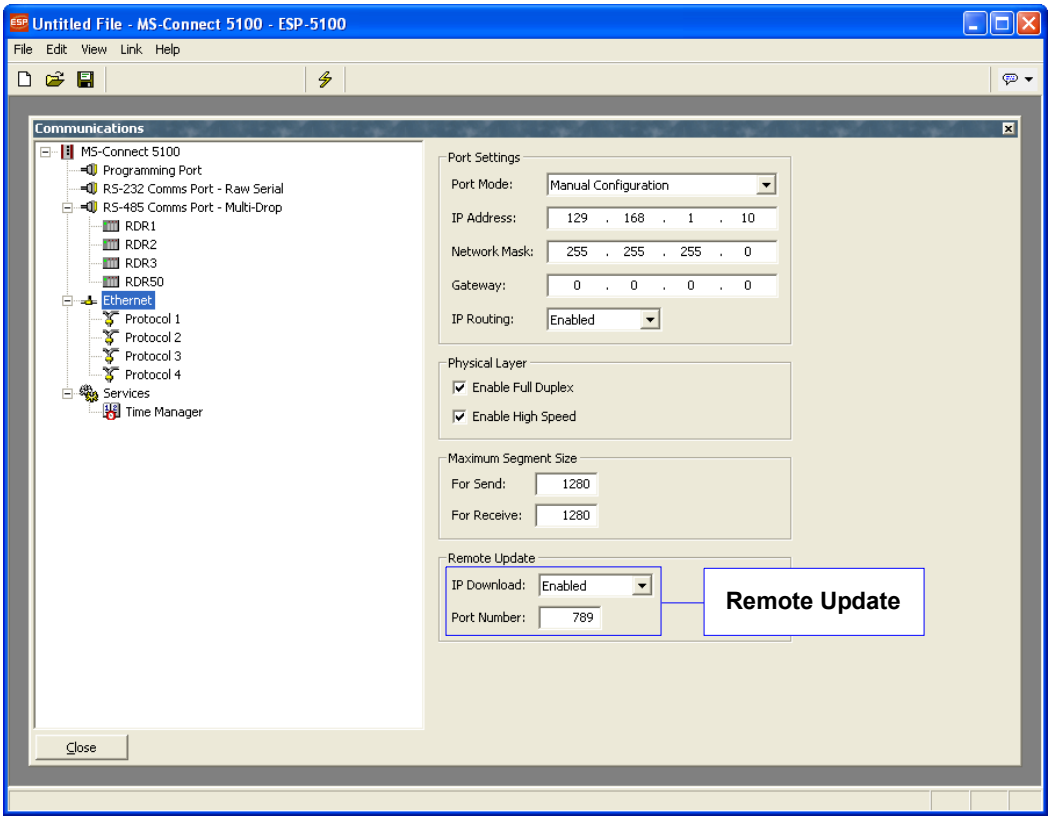
The minimum value that can be entered in both fields is **64** and the maximum value is **2048**.



Remote Update

The **Remote Update** option is used to enable or disable firmware and configuration download via TCP/IP. As noted in the **Link** section, remote firmware updates over TCP/IP require the MS-Connect 5100 to be fitted with a CompactFlash card. Since downloads will more than likely involve a firmware update at some point, such a card is highly recommended when using this feature.

Important: IP Download must be enabled to use the Ethernet port as the programming port.

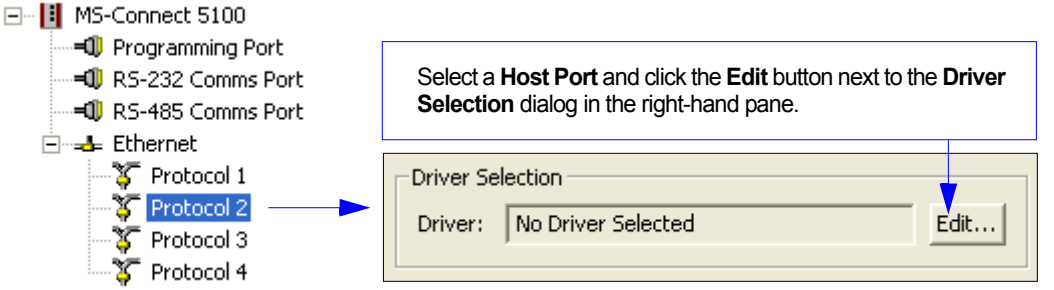


Note: If you are using RS-232 or Ethernet TCP/IP for Multidrop configuration or host communications, see **Configuring Communications** on page 2-12.

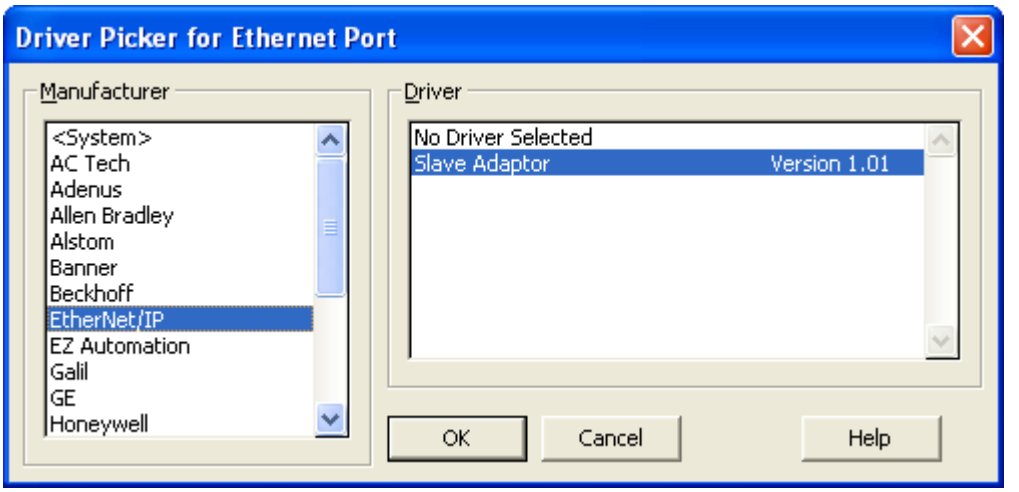
EtherNet/IP Overview

This section explains how to use the MS-Connect 5100 for EtherNet/IP.

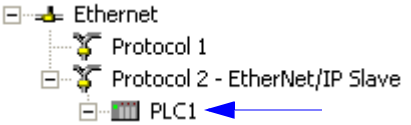
1. Select the appropriate Host Port (serial port or Ethernet) for protocol conversion.



2. Select the manufacturer of your device and the appropriate driver (in this example, the manufacturer is **EtherNet/IP** and the driver is **TCP/IP Slave**).

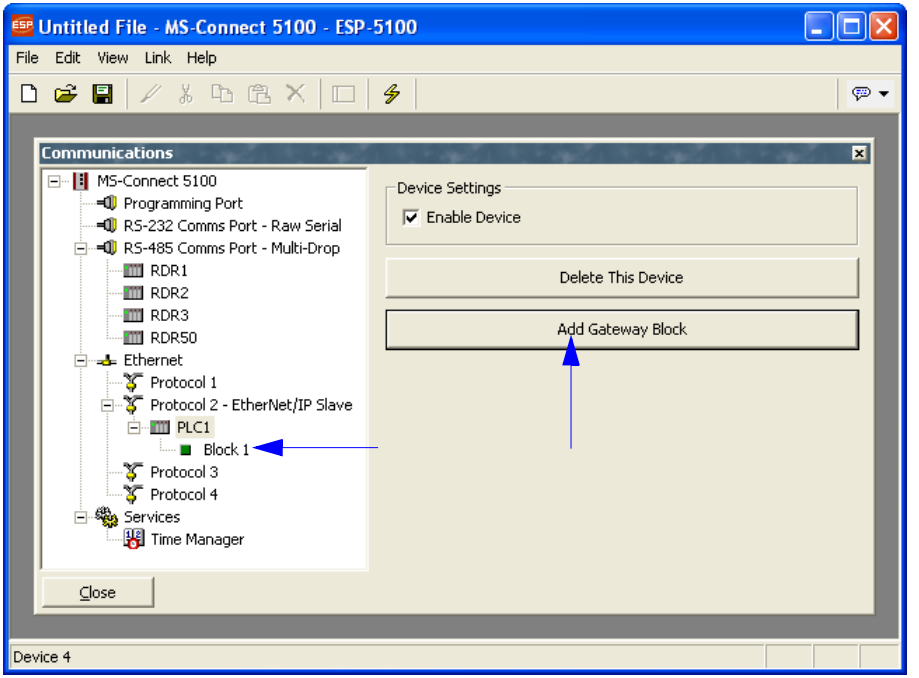


3. Selecting a driver will create a **PLC** in the appropriate location on the **Communications** menu in the left-hand pane, as shown below.



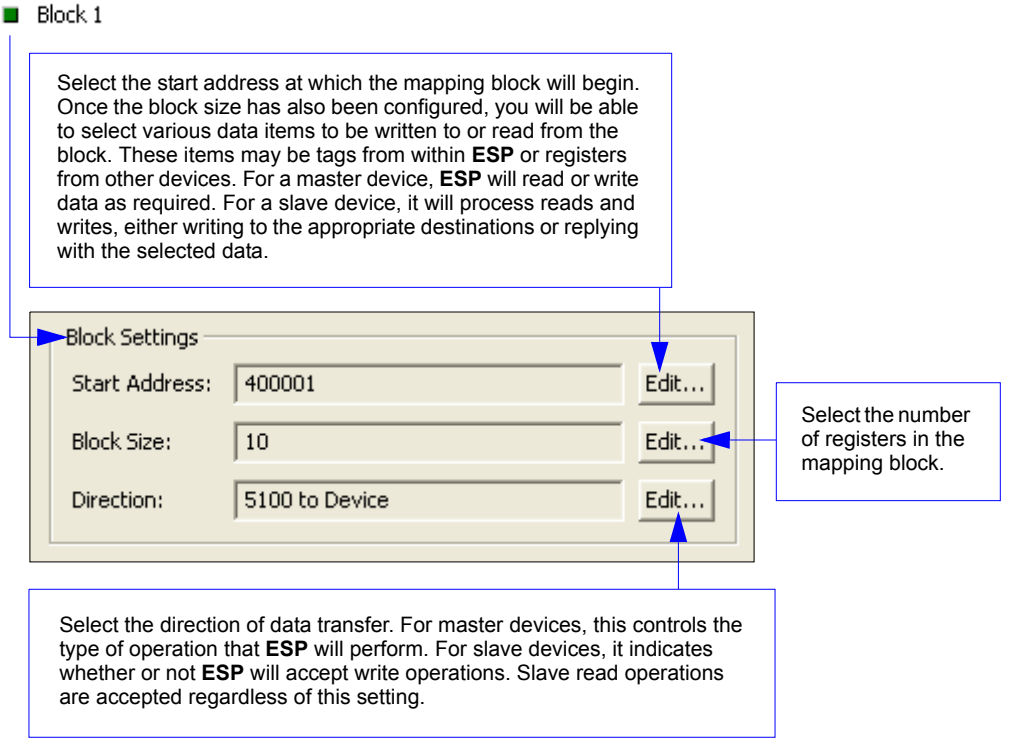
EtherNet/IP Overview (cont.)

4. Create a Gateway Block on the PLC by clicking the **Add Gateway Block** button.



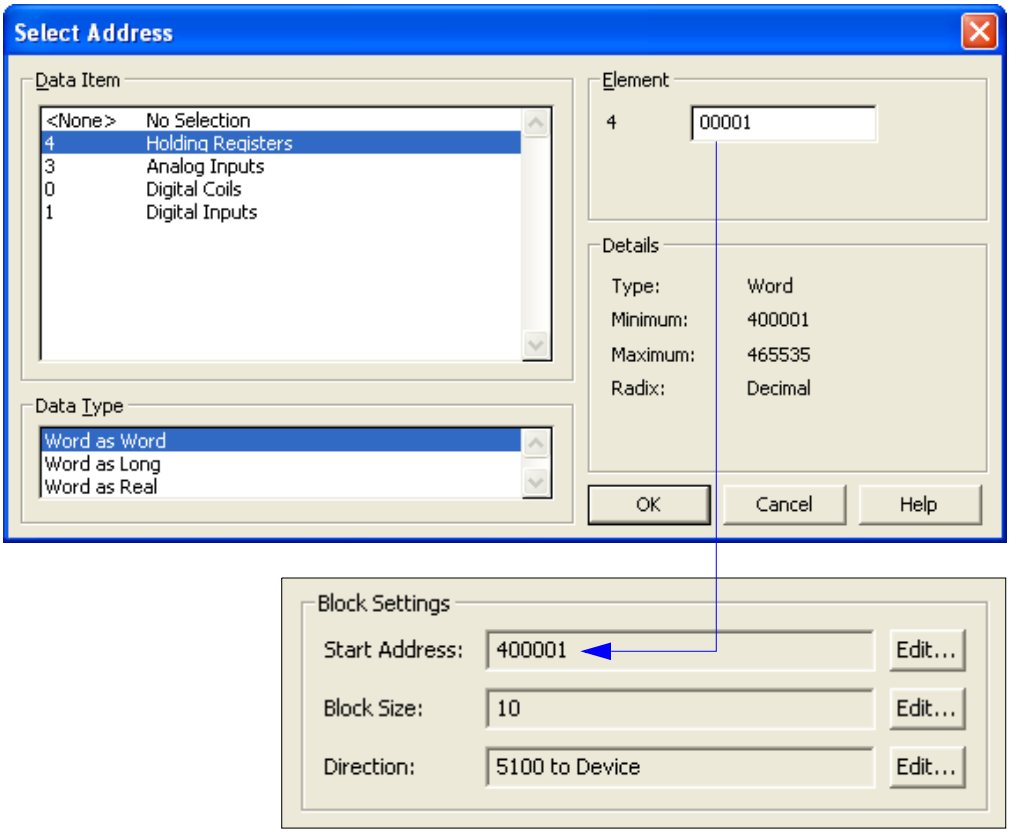
EtherNet/IP Overview (cont.)

5. Click on the **Block** icon in the **Communications** tree in the left-hand pane to display **Block Settings** in the right-hand pane.


Block 1
Select the start address at which the mapping block will begin. Once the block size has also been configured, you will be able to select various data items to be written to or read from the block. These items may be tags from within ESP or registers from other devices. For a master device, ESP will read or write data as required. For a slave device, it will process reads and writes, either writing to the appropriate destinations or replying with the selected data.
Block Settings
Start Address:
400001
Edit...
Block Size:
10
Edit...
Direction:
5100 to Device
Edit...
Select the number of registers in the mapping block.
Select the direction of data transfer. For master devices, this controls the type of operation that ESP will perform. For slave devices, it indicates whether or not ESP will accept write operations. Slave read operations are accepted regardless of this setting.

EtherNet/IP Overview (cont.)

6. Click **Edit** in the **Start Address** row to display **Data Items**, **Data Types**, and **Elements**.

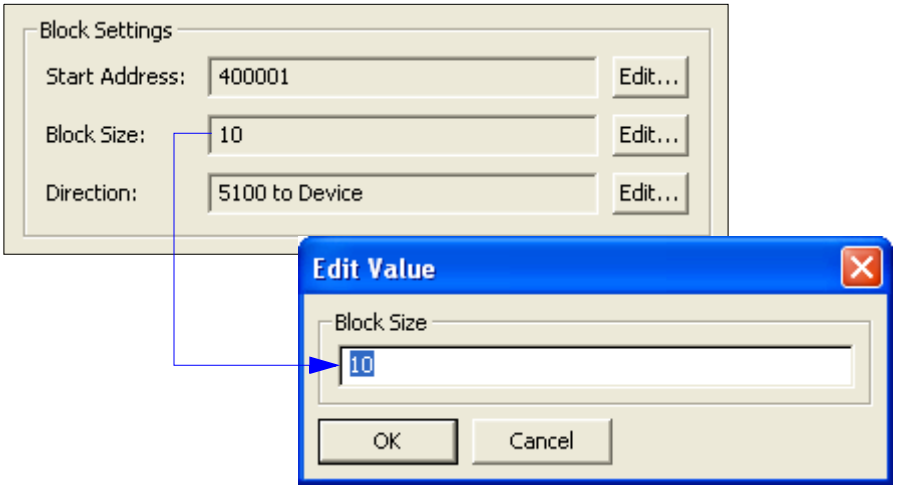


7. Select the appropriate **Data Item**, **Data Type**, and **Element**.

   Important: The **Element** value in this example corresponds to the starting address.

EtherNet/IP Overview (cont.)

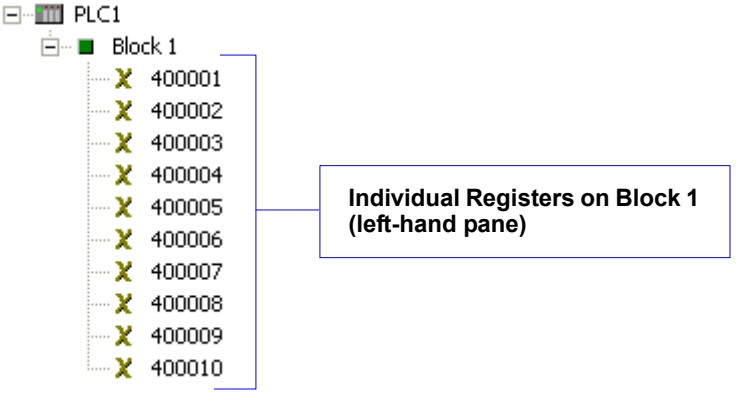
8. Click **Edit** in the **Block Size** row to set block size.



Important: The **Block Size** determines how many registers will appear on the gateway block.

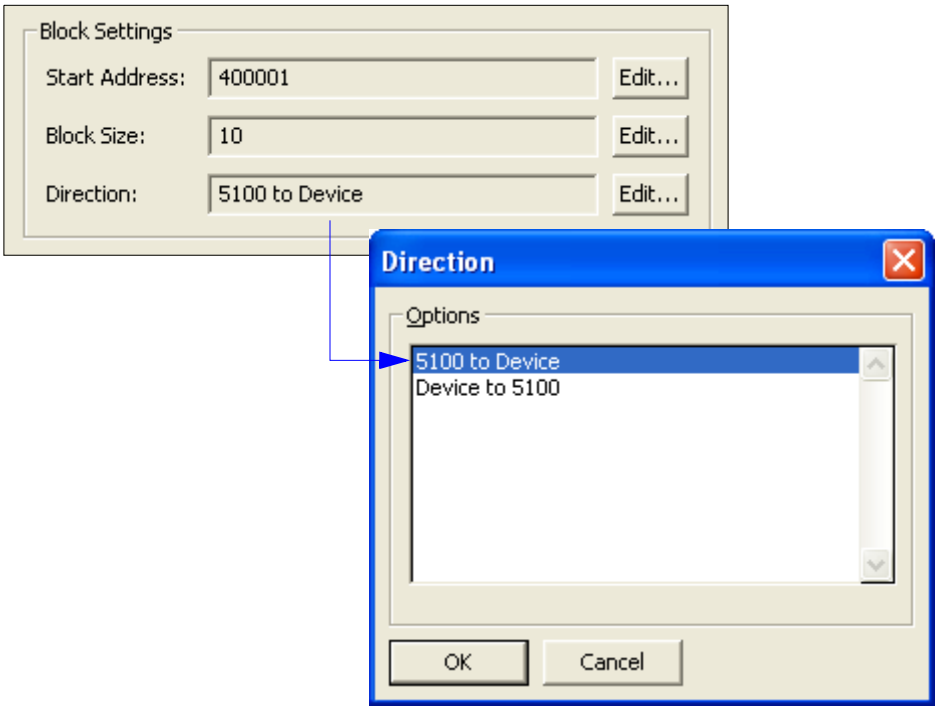
Entries appear in the left-hand pane of the window to represent each of the registers that the block exposes to remote access.

In the example below, **Block 1** has 10 registers exposed to remote access.



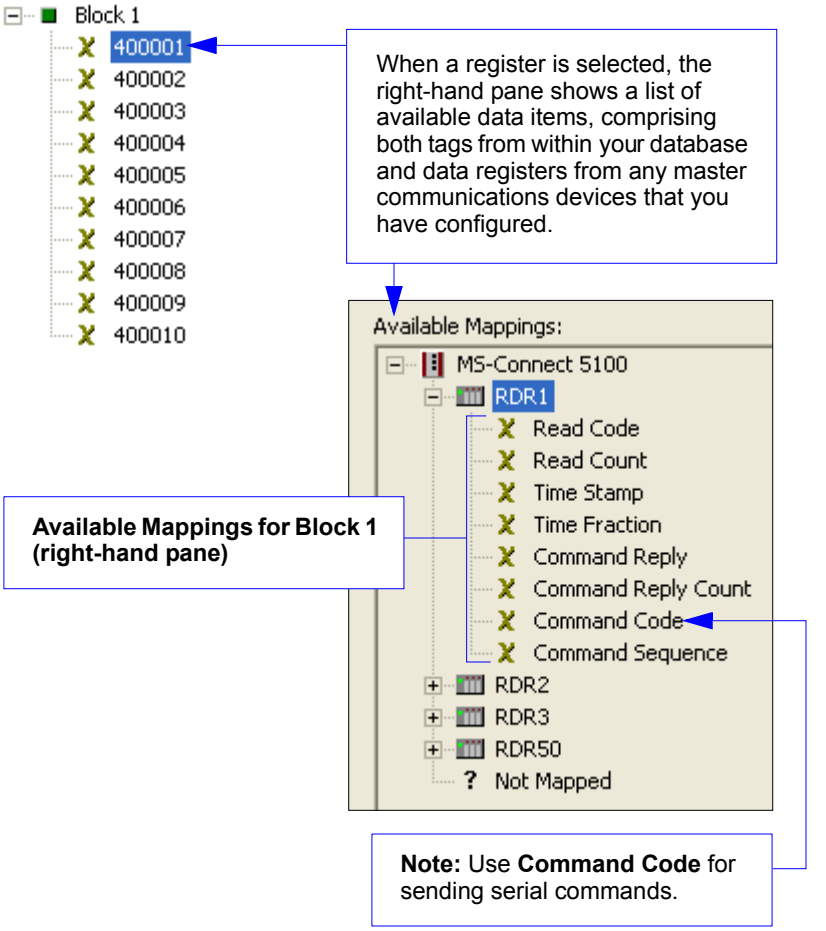
EtherNet/IP Overview (cont.)

9. Click **Edit** in the **Direction** row to set the direction of data.



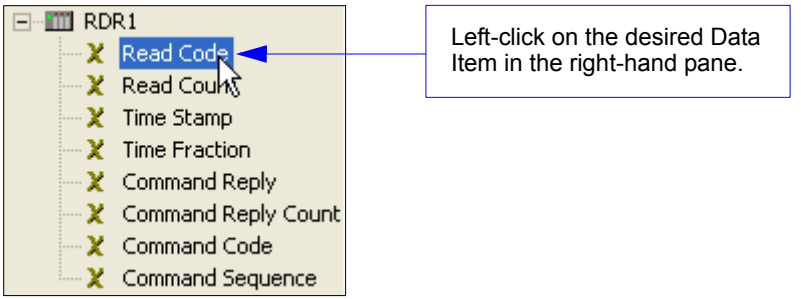
EtherNet/IP Overview (cont.)

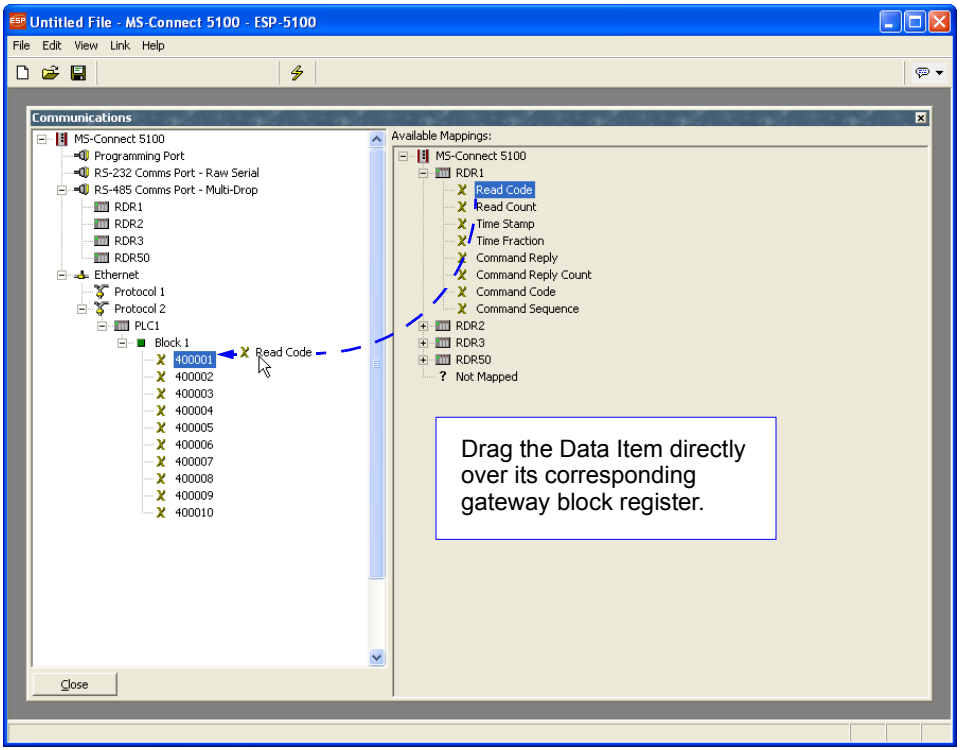
10. Map individual registers.



EtherNet/IP Overview (cont.)

To indicate that you want a particular register within your gateway block to correspond to a particular data item, simply drag that item from the right-hand pane to the left-hand pane, dropping it on the appropriate register entry.

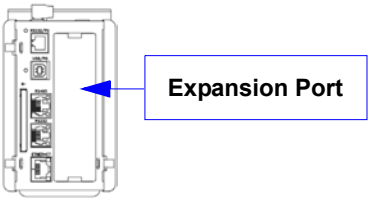




Advanced Communications

This section explains how to use some of the more advanced communications features supported by **ESP**.

Option Cards

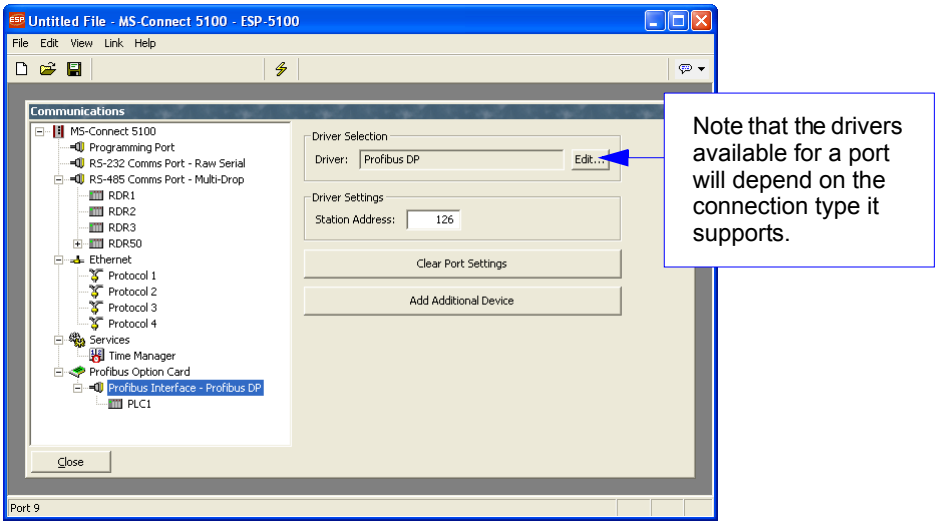


The MS-Connect 5100 is capable of hosting a Profibus expansion card to provide additional communications facilities.

Hardware installation instructions are provided with Profibus cards.

Selecting the appropriate card will add a corresponding icon to the tree control in the left-hand pane of the **Communications** window. Clicking on this icon will contain configuration options for features that are made available by the card.

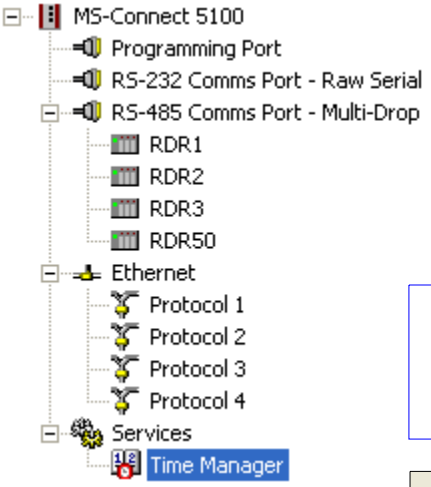
The example below shows configuration options for an MS-Connect 5100 with a Profibus option card installed.



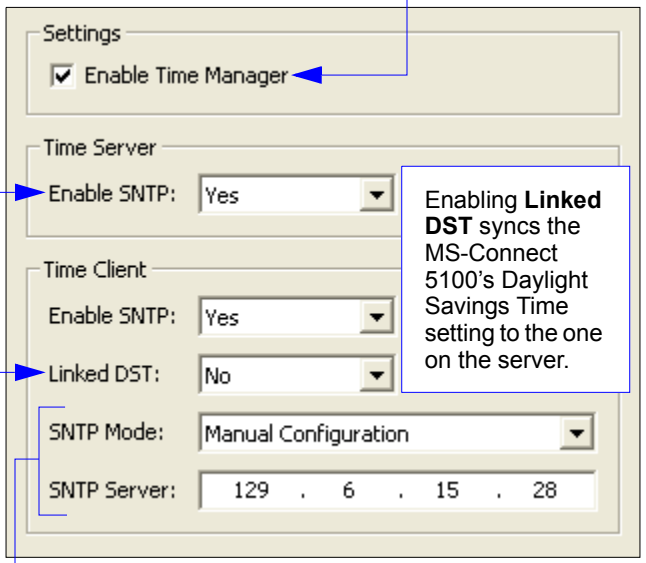
Time Manager

Enabling **Time Manager** allows you to synchronize the MS-Connect 5100's clock with the network and with other Microscan products.

To access time management settings, click on **Time Manager** in the **Communications** tree control.



Once you have enabled time management, you must download the correct time zone to the MS-Connect 5100's using **Link > Send Time** in **ESP**'s menu toolbar.



Enabling **SNTP** (Simple Network Time Protocol) for **Time Server** allows other Microscan products to sync their clocks to the MS-Connect 5100's clock.

Enabling **Linked DST** syncs the MS-Connect 5100's Daylight Savings Time setting to the one on the server.

Enabling **SNTP** for **Time Client** syncs the MS-Connect 5100's clock to another Microscan product's clock or another SNTP time source, such as the time server on your network.

SNTP Mode determines how the SNTP client should be configured.

Enter the IP address of the SNTP server to be contacted in the **SNTP Server** field.

Appendices

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Appendix A — General Specifications

Mechanical

Mounting: Snaps onto standard DIN style top hat (T) profile mounting rails per EN 50022 -35 x 7.5 and -35 x 15
Width: 3.09" (78.5 mm)
Height: 5.3" (134.7 mm)
Weight: 15.1 oz. (456.4 g)

Environmental

Enclosure: IP65
Operating Tempurature: 0° to 50°C
Storage Tempurature: -30° to +70°C
Operating and Storage Humidity: 80% max. relative humidity, non-condensing, from 0 to 50°C
Vibration According to IEC 68-2-6: 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g
Shock According to IEC 68-2-27: Operational 30 g, 11 msec in 3 directions
Altitude: Up to 2000 meters

Electrical

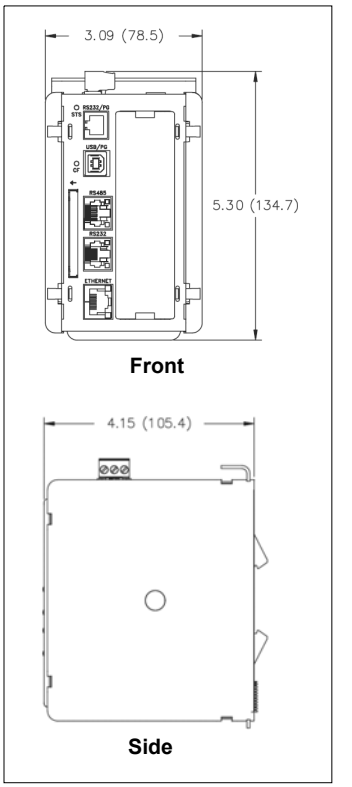
Power Supply: 24VDC ± 10%
200 mA min., without expansion card
1 Amp max. with expansion card fitted
Must use Class 2 or SELV rated power supply
Power Connector: Removable wire clamp screw terminal block
Wire Gauge Capacity: 24 AWG to 12 AWG
Torque: 4.45 to 5.34 in./lb. (0.5 to 0.6 N-m)

Indicator LEDs

STS: Status LED indicates condition of unit
TX/RX: Transmit/Receive LEDs show serial activity
Ethernet: Link and activity LEDs
CF: CompactFlash LED indicates card status and read/write activity

Memory

Onboard User Memory: 4 MB of non-volatile flash memory
Onboard SDRAM: DSPSX: 2 MB; DSPGT: 8 MB
Memory Card: CompactFlash Type II slot for Type I and Type II cards



MS-Connect 5100 Dimensions

Real-Time Clock

Typical accuracy is less than one minute per month drift. ESP-5100's SNTP facility allows synchronization with external servers
Battery: Lithium Coin Cell. Typical lifetime of 10 years at 25 ºC
A "Battery Low" system variable is available so that the programmer can choose specific action(s) to occur when the battery voltage drops below its nominal voltage

Communications

Standard Interfaces: USB/PG (programming), RS-232/PG (programming), RS-232 via RJ12, RS-485 via RJ45, Ethernet via RJ45, wired to Network Interface Card

Safety Certifications

UL/cUL, CE
ISO 9001:2000 Certification No. 06-1080
Issued by TüV USA

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All rights reserved. Specifications subject to change.
Warranty–One year limited warranty on parts and labor. Extended warranty available.

Appendix B — EMI Installation Guidelines

Although this product is designed with a high degree of immunity to Electromagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into a unit may be different for various installations. Cable length, routing, and shield termination are very important and can mean the difference between a successful or unsuccessful installation. Listed are some EMI guidelines for a successful installation in an industrial environment.

1. To reduce the chance of noise spikes entering the unit via the power lines, connections should be made to a clean source. Connecting to circuits that also power loads such as contactors, relays, motors, solenoids, etc., should be avoided.
2. The unit should be mounted in a metal enclosure, which is properly connected to protective earth.
3. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
   c. Connect the shield to common of the MS-Connect 5100 and leave the other end of the shield unconnected and insulated from earth ground.
4. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. In extremely high EMI environments, the use of external EMI suppression devices is effective. The following EMI suppression devices (or equivalent) are recommended:

   Ferrite Suppression Cores for signal and control cables:

   Fair-Rite part number 0443167251

   TDK part number ZCAT3035-1330A

   Steward part number 28B2029-0A0

   Line Filters for input power cables:

   Schaffner part number FN610-1/07

   Schaffner part number FN670-1.8/07

   Corcom part number 1 VR3

Appendix C — Interface Standards

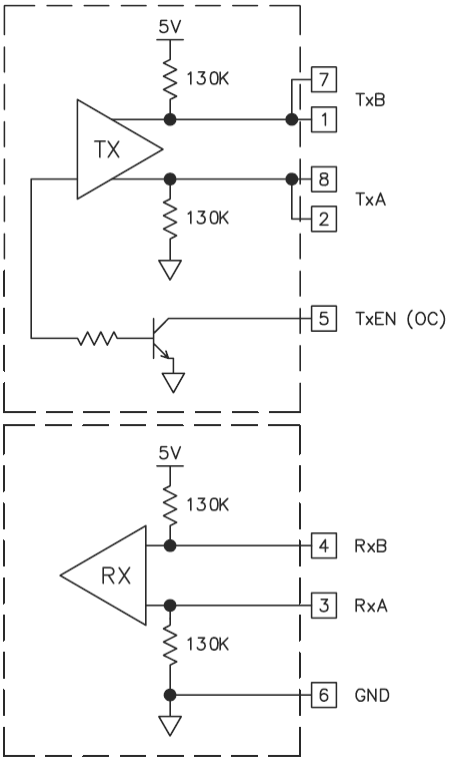
USB/PG Port: Adheres to USB specification 1.1. Device only using Type B connection.

RS-232 Host and RS-232/PG Serial Ports: Format and baud rates for each port are individually software-programmable up to 115,200 baud. Both serial ports via RJ12.

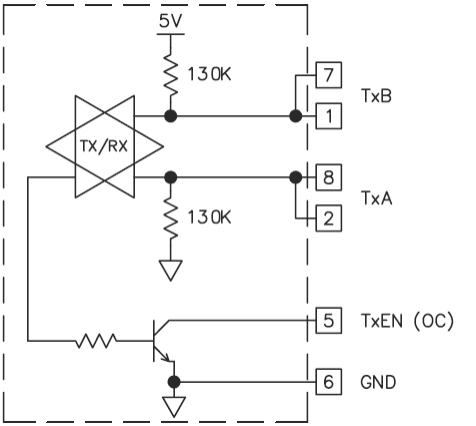
Only the RS-232/PG port can be used for programming, but both can be used for communications with a PLC. The RS-232/PG port can be used for master or slave protocols.

RS-485 Port: RS-485 port via RJ45.

RS-485 4-Wire Connections



RS-485 2-Wire Connections



Ethernet Port: 10 BASE-T / 100 BASE-TX RJ45 jack is wired to NIC (Network Interface Card). When wiring to a hub or switch, use a straight-through cable, but when connecting to another NIC, use a crossover cable.

Appendix D — Indicator LEDs

STS — Status LED

The green status LED provides information regarding the state of the MS-Connect 5100. This includes indication of the various stages of the startup routine (power-up), and any errors that may occur.

LED	Indication
Rapidly Flashing	MS-Connect 5100 is currently running the boot loader and/or being flash-upgraded by ESP.
Steady	MS-Connect 5100 is operating properly.

User Communication Ports — Tx / Rx LEDs

LED	Indication
GREEN	Transmitting
RED	Receiving

Note: LEDs are not available for the RS-232/PG port.

Ethernet LEDs

LED	Indication
YELLOW (Solid)	Link Established
YELLOW (Flashing)	Network Activity
GREEN	10 BASE-T Communications
AMBER	100 BASE-TX Communications

CF — CompactFlash LED

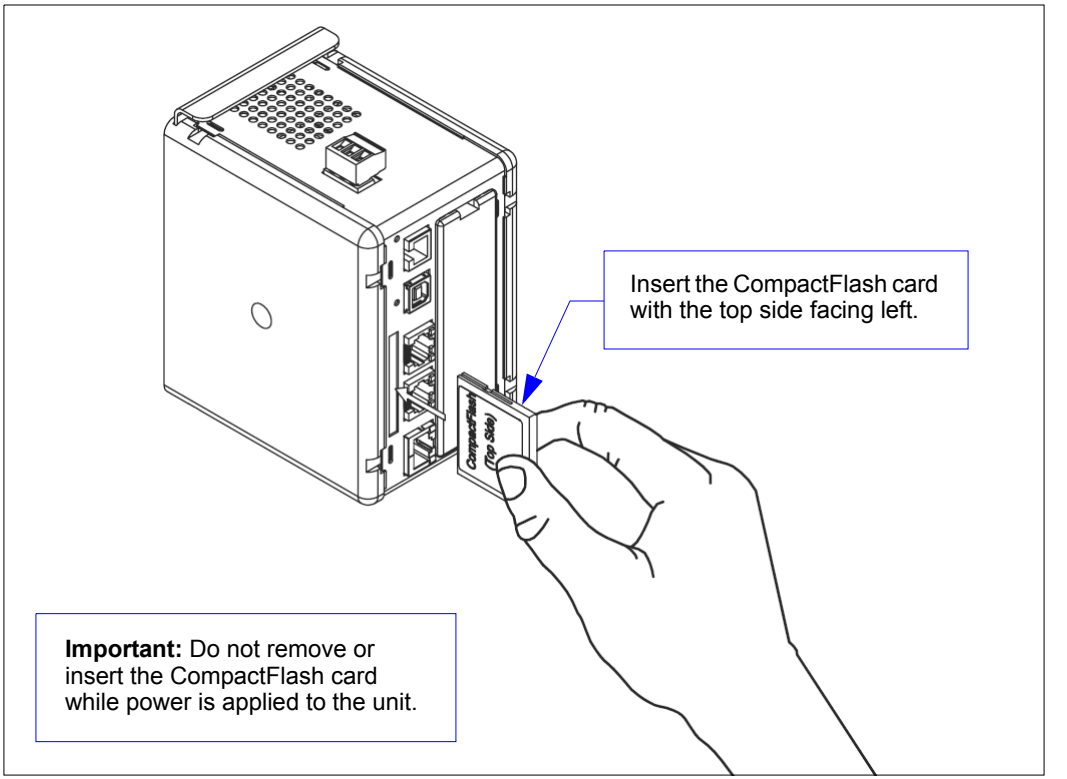
LED	Indication
Off	No CompactFlash card is present.
Steady	Valid CompactFlash card is present.
Flashing Rapidly	CompactFlash card is being checked.
Flickering	Unit is writing to the CompactFlash, either because it is storing data, or because the PC connected via the USB port has locked the drive.[1]
Flashing Slowly	Incorrectly formatted CompactFlash card present.

1. Do not turn off power to the unit while this LED is flickering. The unit writes data in two-minute intervals. Later Microsoft operating systems will not lock the drive unless they need to write data.

Appendix E — CompactFlash® Card

The MS-Connect 5100's CompactFlash Type II socket can be used for troubleshooting and configuration transfers. The socket can accept either Type I or Type II cards, which are available at most computer and office supply retailers. Microscan recommends using cards with a minimum of 4MB of memory.

Information stored on a CompactFlash card can be read by a card reader attached to a PC. This information is stored in Windows PC-compatible FAT16 file format.


Insert the CompactFlash card with the top side facing left.
CompactFlash (Top Side)
Important: Do not remove or insert the CompactFlash card while power is applied to the unit.

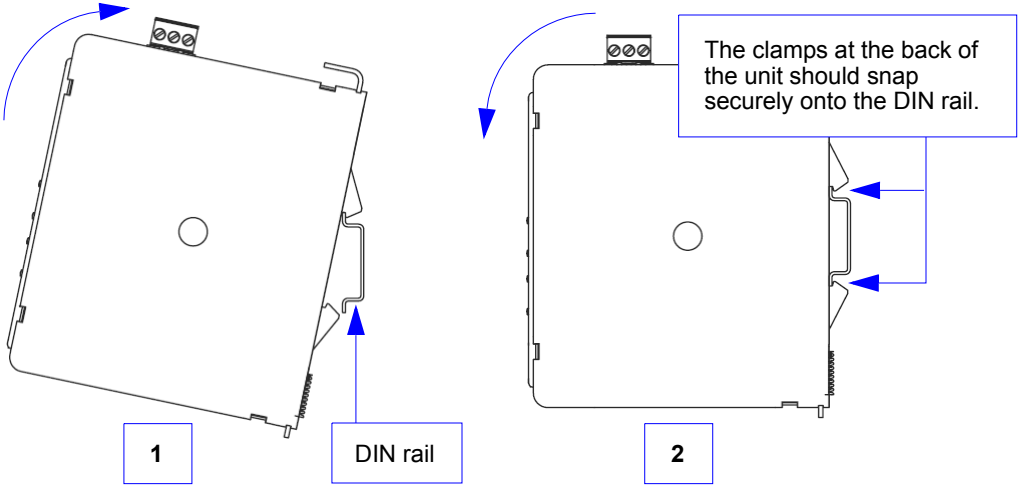
Note: For reliable operation, Microscan recommends the use of SanDisk® and SimpleTech brands of CompactFlash cards.

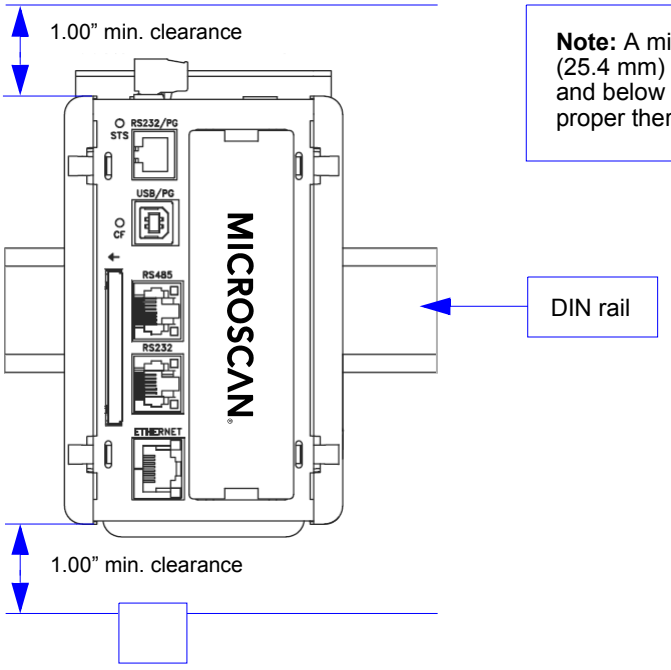
Appendix F — Mounting Options

DIN Rail Mounting

The DIN rail should be positioned horizontally so that the unit's ventilation holes are vertical in relation to cabinet orientation.

Attach the MS-Connect 5100 to the DIN rail as shown below.





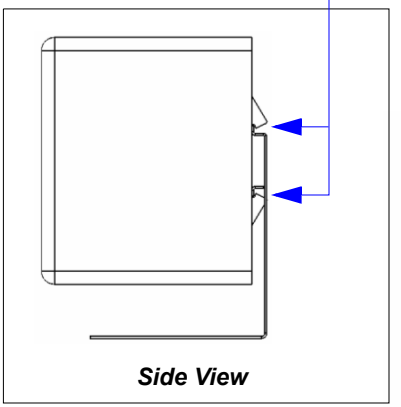
Note: A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Mounting to Flat Surfaces

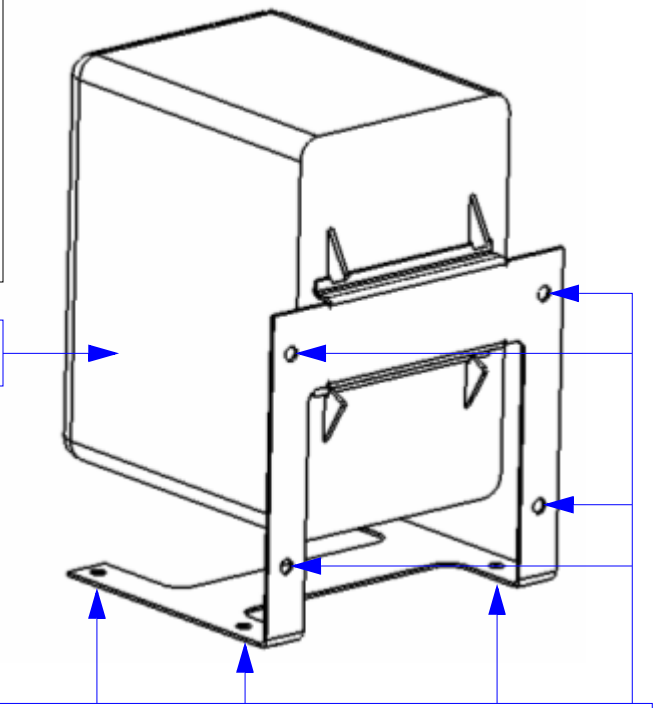
Microscan offers a mounting bracket (10-000251-01) for applications in which the MS-Connect 5100 must be affixed to flat surfaces.

The bracket is angled in such a way that the unit can be mounted to vertical or horizontal flat surfaces.

The clamps at the back of the unit should snap securely onto the rail portion of the mounting bracket, as shown in the illustration.



Side View



The mounting bracket is angled so that the MS-Connect 5100 can be mounted to a vertical or horizontal surface with screws or other fasteners without changing the unit's orientation.

Note: A minimum clearance of 1 inch (25.4 mm) should be maintained above and below the unit in order to ensure proper thermal regulation.

Appendix G — Multidrop Communications

Polling Mode Data Flow Examples

Setup 1

Address	0x01 (translates to) Poll Req @ '0x1C', Unit Select @ '0x1D'
RES	0x04
REQ	0x05
STX	0x02
ETX	0x03
ACK	0x06
NAK	0x15
LRC	disabled

Transfer 1

HOST_TX	'RES' '0x1D' 'REQ' (Select Unit 1 to receive data)
IMAGER_TX	'0x1D' 'ACK' (Unit responds with its address)
HOST_TX	'STX' <T> 'ETX'
IMAGER_TX	'0x1D' 'ACK' (Unit responds with its address)
HOST_TX	'RES' (Terminate Transfer 2)

Transfer 2

HOST_TX	'RES' '0x1C' 'REQ' (Poll Unit 1 for data)
IMAGER_TX	'0x1C' 'STX' <T/00000> 'ETX'
HOST_TX	'ACK'
IMAGER_TX	'RES' (Terminate Transfer 1)

Starting with a 'RES' ensures a clean transaction, without "leftovers" from the previous transaction.

Error Condition 1

HOST_TX	'RES' '0x1C' 'REQ' (Poll Unit 1 for data)
IMAGER_TX	'0x1C' 'STX' <T/00000> 'ETX'
HOST_TX	'*Nothing*' (Host should 'ACK' here)
	timeout reached...
IMAGER_TX	'REQ' (Unit requests an 'ACK' again)
	timeout reached...
IMAGER_TX	'REQ' (Unit requests an 'ACK' again)
	timeout reached...
IMAGER_TX	'REQ' (Unit requests an 'ACK' again)
	timeout reached...
IMAGER_TX	'RES' (Terminate Transfer 1, data is flushed)

Error Condition 2

HOST_TX ‘RES’ ‘0x1C’ ‘REQ’ (Poll Unit 1 for data)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’
HOST_TX ‘*Nothing*’ (Host should ‘ACK’ here)
timeout reached...
IMAGER_TX ‘REQ’ (Unit requests an ‘ACK’ again)
HOST_TX ‘*NAK*’ (Host rejects data frame)
(Retry Event)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’ (Unit sends again)
HOST_TX ‘ACK’ (Host receives data)
IMAGER_TX ‘RES’ (Terminate Transfer 1)

The protocol makes 3 retry attempts before data is flushed and transfer is aborted.

Setup 2

Address 0x01 (translates to) Poll Req @ '0x1C', Unit Select @ '0x1D'
RES 0x04
REQ 0x05
STX 0x02
ETX 0x03
ACK 0x06
NAK 0x15
LRC enabled

Transfer 1

HOST_TX 'RES' '0x1D' 'REQ' (Select Unit 1 to receive data)
IMAGER_TX '0x1D' 'ACK' (Unit responds with its address)
HOST_TX 'STX' <T> 'ETX' 'LRC'
IMAGER_TX '0x1D' 'ACK' (Unit responds with its address)
HOST_TX 'RES' (Terminate Transfer 2)

Transfer 2

HOST_TX 'RES' '0x1C' 'REQ' (Poll Unit 1 for data)
IMAGER_TX '0x1C' 'STX' <T/00000> 'ETX' 'LRC'
IMAGER_TX 'ACK'
HOST_TX 'RES' (Terminate Transfer 1)

Starting with a 'RES' ensures a clean transaction, without "leftovers" from the previous transaction.

Error Condition 1

HOST_TX 'RES' '0x1C' 'REQ' (Poll Unit 1 for data)
IMAGER_TX '0x1C' 'STX' <T/00000> 'ETX' 'LRC'
HOST_TX '*Nothing*' (Host should 'ACK' here)
timeout reached...
IMAGER_TX 'REQ' (Unit requests an 'ACK' again)
timeout reached...
IMAGER_TX 'REQ' (Unit requests an 'ACK' again)
timeout reached...
IMAGER_TX 'REQ' (Unit requests an 'ACK' again)
timeout reached...
IMAGER_TX 'RES' (Terminate Transfer 1, data is flushed)

Error Condition 2

HOST_TX ‘RES’ ‘0x1C’ ‘REQ’ (Poll Unit 1 for data)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’ ‘LRC’
HOST_TX ‘*Nothing*’ (Host should ‘ACK’ here)
timeout reached...
IMAGER_TX ‘REQ’ (Unit requests an ‘ACK’ again)
HOST_TX ‘*NAK*’ (Host rejects data frame)
(Retry Event)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’ ‘LRC’ (Unit sends again)
HOST_TX ‘ACK’ (Host receives data)
IMAGER_TX ‘RES’ (Terminate Transfer 1)

Error Condition 3

HOST_TX ‘RES’ ‘0x1C’ ‘REQ’ (Poll Unit 1 for data)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’ ‘BAD LRC’
HOST_TX ‘NAK’ (Host rejects bad LRC data)
(Retry Event)
IMAGER_TX ‘0x1C’ ‘STX’ <T/00000> ‘ETX’ ‘GOOD LRC’ (Unit sends again)
HOST_TX ‘ACK’ (Host receives data)
IMAGER_TX ‘RES’ Terminate Transfer 1)

The protocol makes 3 retry attempts before data is flushed and transfer is aborted.

Appendix H — ASCII Table

Dec	Hex	Mne	Ctrl
00	00	NUL	^@
01	01	SOH	^A
02	02	STX	^B
03	03	ETX	^C
04	04	EOT	^D
05	05	ENQ	^E
06	06	ACK	^F
07	07	BEL	^G
08	08	BS	^H
09	09	HT	^I
10	0A	LF	^J
11	0B	VT	^K
12	0C	FF	^L
13	0D	CR	^M
14	0E	SO	^N
15	0F	SI	^O
16	10	DLE	^P
17	11	DC1	^Q
18	12	DC2	^R
19	13	DC3	^S
20	14	DC4	^T
21	15	NAK	^U
22	16	SYN	^V
23	17	ETB	^W
24	18	CAN	^X
25	19	EM	^Y
26	1A	SUB	^Z
27	1B	ESC	^[
28	1C	FS	^\
29	1D	GS	^]
30	1E	RS	^^
31	1F	US	^_

Dec	Hex	Ch
32	20	SP
33	21	!
34	22	“
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Ch
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Ch
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	D

Appendix I — Protocol Command Table

Protocol Command (Mnemonic displayed on menu)	*Control Characters (Entered in menu or serial command)*	*Hex Value*	*Effect of Command*
RES	^D	04	Reset
REQ	^E	05	Request
EOT	^D	04	Reset
STX	^B	02	Start of Text
ETX	^C	03	End of Text
ACK	^F	06	Acknowledge
NAK	^U	15	Negative Acknowledge
XON	^Q	11	Begin Transmission
XOFF	^S	13	Stop Transmission

Appendix J — Glossary of Terms

Baud Rate — The number of discrete signal events per second. Bits per second.

Connector — Physical device (plug or socket) on a device or cable to provide in/out connectivity for various circuits and pins.

Data Bits — The number of bits used to represent one character of data output.

Decode — A Good Read. The successful capture and output of the information encoded in a symbol.

Discrete I/O — Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

Firmware — Software hard-coded in non-volatile memory.

Good Read — A decode. The successful capture and output of the information encoded in a symbol.

Host — A computer, PLC (Programmable Logic Controller), or other device that is used to execute commands and to process data and discrete signals.

Input — A channel or communications line. The decoded data or discrete signal that is received by a device.

LED (Light-Emitting Diode) — Often used as a performance indicator, as on the exterior of the MS-Connect 5100.

LRC (Longitudinal Redundancy Check) — An error checking routine that verifies the accuracy of transmissions.

Master Symbol — A symbol whose data is stored in a reader and compared to other symbols in an application as they are decoded. Useful in applications that require sortation and routing.

Matchcode — A method of comparing current decoded symbol data against stored master symbol data. Useful in applications that require sortation and routing.

Micro-Change — A threaded, sealed connector that provides secure cabling in industrial and automation environments.

New Master — A condition in which a reader decodes and stores a new master symbol in an application using matchcode.

No Read — A condition in which a reader fails to decode a candidate symbol.

Normally Closed — A discrete output state that is only active when open.

Normally Open — A discrete output state that is only active when closed.

Opto-isolation — The transfer of signals between elements of a circuit (typically a transmitter and receiver) while keeping the elements electrically isolated. An example of opto-isolation is the relationship of an LED and a light sensor, separated from each other so that light can travel across a barrier but electrical current cannot.

Output — A channel or communications line. The data or discrete signals that are transmitted or displayed by a device.

Parity — An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1s in the data field is even or odd.

Port — Logic circuit for receiving and transmitting data. (One or more ports may be included within a single connector.)

Protocol — The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

Read Cycle — A pre-defined period of time during which a reader will attempt to capture symbol data.

RoHS (Reduction of Hazardous Substances) — A directive that restricts the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ether (PBDE) in the manufacture of certain types of electronic and electrical equipment.

Signal — A transmission of analog or digital information, electrical current, voltage, or another specific quantity, that can be varied in such a way that it conveys information from one point to another.

Symbology — A symbol type, such as Code 39 or Code 128, with special rules to define the widths and positions of bars (or 2D modules) and spaces to represent specific numeric or alphanumeric information.

Trigger — A signal, transition, or character string that initiates a read cycle.

WEEE (Waste Electrical and Electronic Equipment) — A directive that requires manufacturers of electrical and electronic equipment to take responsibility for the disposal of that equipment.